FINAL
ENVIRONMENTAL IMPACT STATEMENT

WESTMORELAND RESOURCES'

ABSALOKA MINE

REVISED PLAN

BIG HORN COUNTY, MONTANA

Montana Department of State Lands
and United States Department of the Interior
OSM-EIS-16

Type of Statement: Final Environmental Impact Statement

Lead Agencies:

State of Montana, Department of State Lands
U.S. Department of the Interior, Office of Surface Mining, Reclamation and Enforcement

Cooperating Agency:

U.S. Department of the Interior, Bureau of Indian Affairs

Proposed Action:

Approvals to expand Westmoreland Resources' Absaloka Mine by 629 acres.

For additional information or copies of this EIS, please contact:

Kit Walther
Department of State Lands
Capitol Station
Helena, MT 59620
(406) 444-2711

Charles Albrecht
Office of Surface Mining
Western Technical Center
1020 15th Street
Denver, CO 80202
(303) 844-5656

DEPARTMENT OF STATE LANDS

TED SCHWINDEN, GOVERNOR

CAPITOL STATION

STATE OF MONTANA

(406) 444-2074

1625 ELEVENTH AVENUE
HELENA, MONTANA 59620

November 30, 1984

Dear Reader:

With this letter we are sending you the final environmental impact statement (EIS) for the Absaloka Mine. A draft EIS was issued by the Montana Department of State Lands and the U.S. Department of Interior, Office of Surface Mining in May 1984. During the comment period that followed, the agencies received written comments and testimony. This final EIS provides further analyses of certain issues and the agencies' responses to the comments.

Changes from the draft EIS are underlined in all chapters except chapter IV and the appendixes. Chapter VI contains the written comments and the agencies' responses.

Kit Walther

Kit Walther
Chief
Environmental Analysis Bureau
Department of State Lands

Charles M Albrecht

Charlie Albrecht
Chief
Environmental Analysis Branch
Office of Surface Mining
Western Technical Center

NRIS #61

Final

ENVIRONMENTAL IMPACT STATEMENT

WESTMORELAND RESOURCES' ABSALOKA MINE REVISED PLAN

December 1984

Montana Department of State Lands

Dennis Hemmer, Commissioner

U.S. Office of Surface Mining

John Ward, Director

OSM-EIS-16

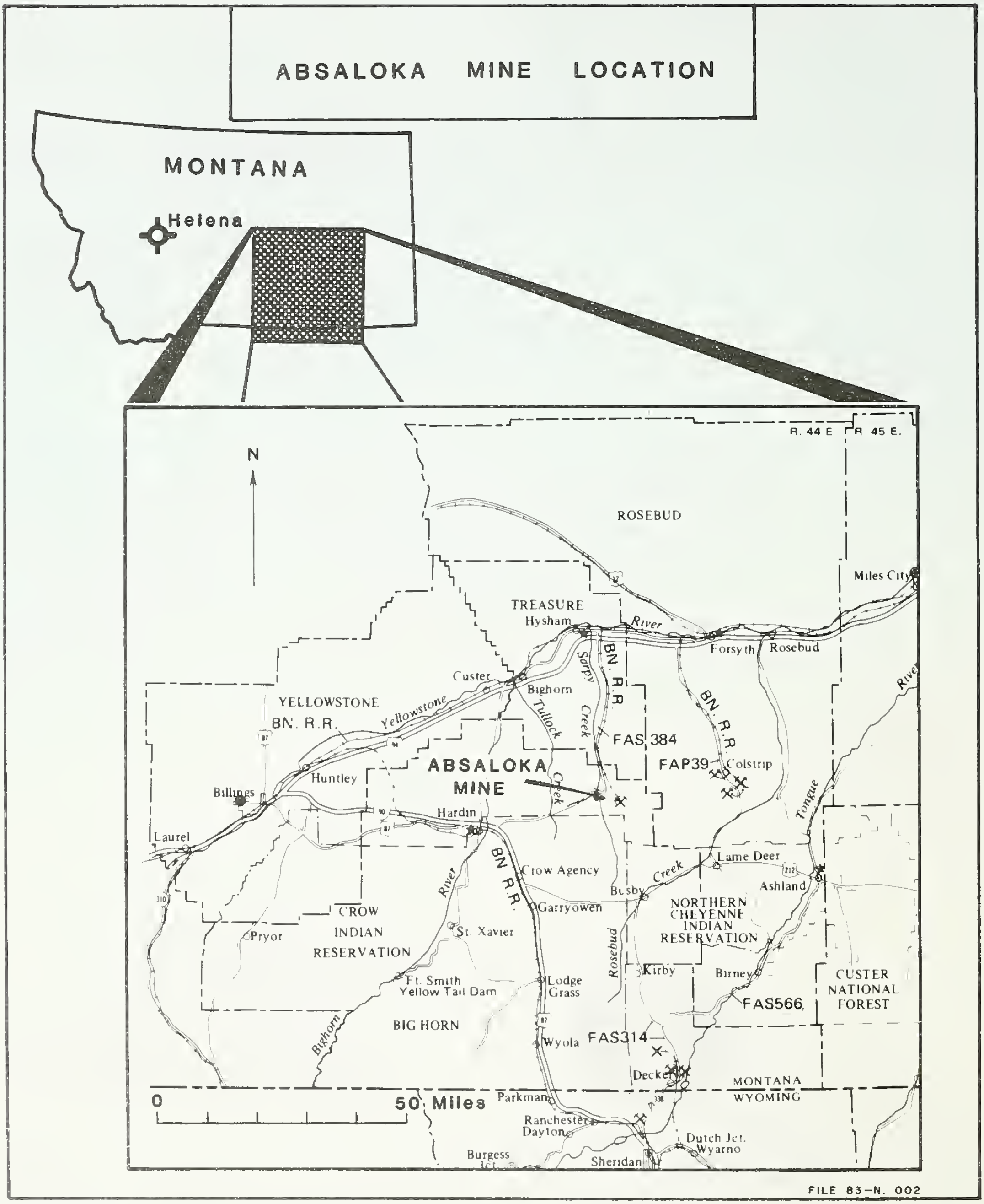


FIGURE S-1

The mine lies on the eastern edge of Big Horn County, 26 miles east of Hardin, the county seat. Just south of the mine is the Crow Indian Reservation. Just west, Sarpy Creek flows north to the Yellowstone River.

ABSALOKA MINE

REVISED PLAN

In May, 1984, the Montana Department of State Lands and the U.S. Department of the Interior issued a draft environmental impact statement on Westmoreland Resources' revised mine plan for the Absaloka Mine. The draft document was revised and this final EIS is the result.

Action Under Consideration

Westmoreland Resources has submitted an application to expand the Absaloka Mine by 629 acres (fig. S-1). The Commissioner of the Montana Department of State Lands and the Secretary of the Department of the Interior are required to make a decision on whether to issue the necessary approvals for mining. Before the agencies are the following alternatives: (1) approve the application as proposed (see chapter I and III), (2) reject the application (see chapter IV), (3) selectively reject approval (see chapter IV) or, (4) approve mining with special conditions (see chapters III and IV).

The Company's Proposal

Westmoreland proposes to mine an additional 65 million tons of coal in the permit application area. Mining would take place over 13 years at a rate of about 5 million tons per year. The coal in the application area would come from Crow Indian coal leases. If the permit application is approved, the company could begin operations in the new area in 1985.

The lands proposed for mining under the new application have been analyzed in previous long-range mining plans and environmental evaluations. The mining and reclamation plans, however, have changed.

Along with the permit application, the company has submitted preliminary plans for the remainder of the mine's life. Although these plans do not apply specifically to the pending decision, they are evaluated in this environmental impact statement to the extent possible. In the life-of-mine plan, the company would mine an additional 208 million tons of coal from 2,096 acres, and the mine would close in 2017. Unlike the proposed plan, the life-of-mine plan includes some acreage that has not been previously evaluated. (See chap. I.)

Preferred Alternative

The agencies' preferred alternative is approval of mining with six special conditions. The special conditions would require Westmoreland to--

(1) Replace original acreages of ponderosa pine forest.

(2) Increase pine planting rates in small areas (together totaling 30 acres) to accelerate development of closed-canopy ponderosa pine forest.

(3) Replace today's acreages of drainage bottom vegetation types (deciduous trees and shrubs and aquatic vegetation).
(4) Seed drainage-bottom grasses (app. E) around the parts of impoundments that do not support aquatic vegetation.
(5) Construct fenced overflow ponds at the two proposed stock tanks in the application area.
(6) Construct fences that limit cattle access around the two proposed permanent impoundments.

Summary of Impacts

Geology: Throughout the mine area, some erosion and sedimentation of reclaimed lands would be unavoidable. The two permanent impoundments proposed to replace the springs destroyed or dried up by mining would probably function as intended with long-term maintenance. Moderate problems with drainage system stability may eventually arise. The company's application plan would establish a postmining rootzone that is acceptable for plant growth. Some of the rootzone spoil could contain elevated levels of molybdenum, which in turn could cause a copper-molybdenum imbalance in forage.

Hydrology: Seven springs would be removed by mining in the application area and at least three other springs would probably cease flowing during mining due to associated disturbances and lowered water tables. Three of these ten springs are apparently perennial surface water supplies. The proposed plan to restore surface water supplies would be partially successful; therefore, the loss of springs would be permanent (with the likely exception of spring 12), reducing the spring water in the mine area. In the life-of-mine plan, another ten springs would be lost. Impacts to the local hydrologic system would be minimal. No impacts are likely to occur to East Fork Sarpy Creek.

Soils: The disturbance area contains excessive amounts of fine sandy loam soil. These soils are potentially erosive until vegetation is established. Coulee-bottom soils are often wet, and if salvaged when wet, would cause severe compaction and total deterioration of soil structure, which could adversely affect revegetation of coulee bottoms. Overall, impacts to soils would not be significant.

Vegetation: Mining of the application area would destroy 573 acres of vegetation over 13 years. After revegetation, grasslands would cover 74 percent of the disturbance area compared to 35 percent at present. This would increase livestock forage production, although plant species diversity would decline. Agricultural land (cropland) and the closed-canopy ponderosa pine forest would be eliminated. The amount of deciduous shrubs, trees, and vegetation beside ponds would decline substantially. Reestablishment of the open-canopy pine forest would probably succeed.

Aquatic Ecology: Aquatic habitat and associated organisms would be substantially reduced in the North Coulee's drainage area. This impact would be significant in the application area. However, this reduction would not be regionally significant. No threatened or endangered species exist in the North Coulee.

Wildlife: Mining in the application area would temporarily force wildlife from, and destroy, 573 acres of habitats, including one great-horned owl nest. After mining, reclaimed lands would supply foraging areas for deer, turkeys, and sharp-tailed grouse. However, the change in water sources (with associated vegetation) and the decreased acreage of woody cover would lower habitat quality for deer, turkeys, grouse, waterfowl, and several nongame species. Also, decades would be required for reestablished ponderosa pines to supply adequate cover. Although mining would have significant impacts on many wildlife species on the application area, regional effects would be negligible.

Climate: Continued mining would not affect the climate.

Air Quality: During maximum production, mining would cause significant impacts to present air quality. Total suspended particulate (TSP) concentrations would increase, especially close to mining and the processing facilities. But the Montana and Federal Ambient Air Quality Standards would not be exceeded.

Economics: Impacts to the local economy would not be significant. Any new mine jobs resulting from increased coal production are likely to go predominately to Crow Indian workers. At maximum, 140 more jobs would be created at the mine. In the county, total employment is projected to continue to grow at current, modest rates through the life-of-mine period. At full production, the mine's payroll would increase from $4.1 million to $8.7 million per year.

Social Conditions: The continued operation of the Absaloka Mine would not cause significant impact to the social organization, population, or housing of Big Horn County, the Crow Reservation, or the Northern Cheyenne Reservation.

Social and Community Services: More social and community services would be needed in Big Horn County and on the Crow Reservation in the future. All new service demands would come from natural population increase, not the continued operation of the Absaloka Mine. Thus, impact to social and community services from mining activity would be minor.

Fiscal Conditions: In the application and life-of-mine plans, tax revenues would vary with coal production, but the general fiscal condition of the government units surrounding the mine would remain unchanged from recent years.

Land Use: Mining would temporarily eliminate agricultural uses on the minesite. After reclamation, cropland would be eliminated, ponderosa pine would decrease, and the amount of rangeland would increase. The loss of agricultural production to the region would be negligible.

Transportation: Mining as proposed would not noticeably change the amount of vehicle traffic on FAS 384 or the congestion at railroad crossings used by unit coal trains. Increased mining, at annual production rates up to 10 million tons per year, also would not noticeably affect highway traffic, but would aggravate railroad crossing congestion.

Outdoor Recreation: Further mining at the Absaloka Mine would not affect the quality of recreation in the region.

Cultural Resources: The mine would not affect historical or archeological sites in the mine area that are either listed or eligible for listing on the National Register of Historic Places.

Aesthetics: The mine operations would initially destroy the landscape of the mine area. After mining, reclamation would blend the minesite with surrounding lands. In the long term, aesthetic impacts would be negligible.

Chapter III (continued)

LIST OF FIGURES

LIST OF TABLES

THE EIS: WHY IT IS WRITTEN
WHO TAKES PART
WHAT DECISIONS MUST BE MADE

Since opening the Absaloka Mine in 1974, Westmoreland Resources Inc. has received approval to operate in an area covering 2,630 acres. Westmoreland is seeking approval from the Montana Department of State Lands, in accordance with the Montana Strip and Underground Mine Reclamation Act, and the U.S. Department of the Interior, in accordance with the Surface Mining Control and Reclamation Act and the Omnibus Indian Mineral Leasing Act, to mine within an additional 629 acres. If approved, mining of the new area would begin in 1985.

Westmoreland's Absaloka Mine is located within the Crow ceded area. For the action analyzed in this EIS, the federal government and the state of Montana do not agree as to whether the coal currently being mined by Westmoreland pursuant to a lease from the tribe is or is not "Indian lands," as the term is defined in the Surface Mining Control and Reclamation Act (SMCRA). Furthermore, if the coal is Indian lands, the agencies do not agree as to which is the regulatory authority. Consequently, both DSL and OSM have asserted jurisdiction and are reviewing the application jointly without conceding each other's jurisdictional claim.

THE EIS

The Department of State Lands (DSL) and the U.S. Department of the Interior (DOI) have determined that a decision on Westmoreland's application may "significantly affect the quality of the human environment." Therefore, before making a decision on the company's application, DSL and DOI are required to prepare an environmental impact statement (EIS) (Montana Environmental Policy Act [MEPA], 1971, and National Environmental Policy Act [NEPA], 1969). Within DOI, the Office of Surface Mining, Reclamation and Enforcement (OSM) is the lead agency and the Bureau of Indian Affairs (BIA) is a cooperating agency.

To date, as required by MEPA and NEPA, DSL and DOI have--

(1) issued a draft EIS (in May 1984).

(2) encouraged and accepted public comments on the draft (until July 30, 1984).

Publication of this final EIS by DSL and DOI is a part of the EIS process. This final document contains (a) corrections and clarifications of the draft text and (b) answers to each substantive comment. All changes and additions since the draft, except in chapters IV and V, have been underlined. Readers familiar with the draft can speed their review by reading only (1) the underlined sections (2) chapter IV and (3) chapter V.

Chapter IV has been expanded for the final EIS to include analyses of two specific options of selective rejection recommended by the public. At the end of chapter IV the alternatives are compared with the proposal. Chapter V is a new addition to the final EIS containing letters from the public and answers from DSL and DOI concerning the draft EIS.

After publishing the final EIS, DSL and DOI must make a decision on Westmoreland's application. The Department of State Lands can make a decision no sooner than 15 days following publication of the final EIS; DOI can make a decision no sooner than 30 days following publication by the U.S. Environmental Protection Agency that the final EIS is available. The agencies' preferred alternative is discussed in chapter IV.

The EIS analyzes (1) the company's proposal, (2) the lands, people, and resources that the proposal would affect, and (3) the consequences (or impacts) of the proposal. The document is used as one of the tools in making the decisions. The preparation of the EIS helps ensure the proposed operation is well planned and that the concerns of all agencies, organizations, and citizens are considered before a decision is made.

PREVIOUS DOCUMENTS AND RESEARCH

Since Westmoreland first applied for approval to mine in the early 1970s, a number of documents have been written analyzing the Absaloka Mine (U.S. Department of the Interior [USDI], 1974, 1976, and 1977; Montana Department of State Lands [MDSL], 1977 and 1979; and USDI and MDSL, 1980). Two of them, one prepared by the U.S. Geological Survey (USDI) in 1977 and the other by the Department of State Lands in 1979, were EISs that analyzed Westmoreland's original 20-year mining and reclamation plan. The present application is a revision of the 20-year plan. The proposal contains a larger mine area and more data on the area to be mined.

This EIS does not repeat all analyses contained in the earlier EISs. All aspects of the mine are described, but a detailed discussion is included only of topics that, for various reasons, require further analysis. The reader interested in past analyses is referred to the 1977 and 1979 documents:

U.S. Department of the Interior, Geological Survey. 1977. Final Environmental Impact Statement--Proposed 20-Year Plan of Mining and Reclamation. Westmoreland Resources Tract III, Crow Indian Ceded Area, Montana. Reston, Virginia. 495 pages and 5 appendixes.

Montana Department of State Lands. 1979. Final Environmental Impact Statement--Westmoreland Resources, Inc., Absaloka Mine. Helena, Montana. 122 pages. [Draft EIS incorporated by reference.]

This EIS analysis draws data from many sources in addition to the two previous EISs. Each source is listed under Literature Cited at the end of the EIS. Two of these documents deserve special mention here.

The application, a 12-volume set, contains detailed, comprehensive data on most of the topics in the EIS. The data, collected over the last decade, range broadly, covering such topics as hydrology, vegetation, soils, archeological sites, wildlife, and aquatic ecology. Much of the information found in the EIS comes from exhaustive descriptions and species inventories in the application. For those interested, the application is available for review at the Department of State Lands, Helena and Billings, and the Office of Surface Mining, Denver.

Since the permit application does not cover socioeconomic topics, DSL and OSM have relied on a comprehensive study of the social conditions and economy of the area surrounding the Decker mines (Mountain West Research-North Inc., 1983). The resulting report, a 1,600-page document submitted with many smaller special reports, discusses Sheridan County, Wyoming, Big Horn County, Montana, and the Northern Cheyenne and Crow Indian Reservations. The impacts of the Absaloka Mine are included in the information for Big Horn County.

Much of the EIS's coverage of social sciences, such as taxes, schools, population, and housing, comes from the Mountain West report. The report can be reviewed at a number of local government offices, including DSL and OSM. For most people, the easiest way to review a copy is to request one from the state library system through interlibrary loan.

SCOPE OF ANALYSIS

To assist in defining the scope of this analysis, DSL and OSM mailed 500 questionnaires in August 1983 to people interested in the Absaloka Mine. Concerns raised in the questionnaires are listed below. These concerns, and those of DSL and OSM, are evaluated in the EIS.

- How would hunting and habitat loss affect wildlife?
- What impacts would there be on surface and ground water? Would there be any impacts on the main or East Fork of Sarpy Creek? Would water tables change in alluvial valley floors? Will ground water tables and flows be reestablished after mining? How?
- How would the mine affect employment?
- How would the mine affect tax revenues?
- Can coulee-bottom vegetation be reestablished after mining? Will deciduous shrubs, even those planted as tublings, survive?

In analyzing the range of alternatives available to DSL and DOI, the EIS evaluates both the immediate and cumulative effects of Westmoreland's mining and reclamation plan. Included in the analysis are the impacts resulting directly from mining and those resulting from increases in employment and economic activity.

The EIS covers two levels of mine development. Analyzed in the greatest detail is Westmoreland's proposed (13-year) plan, for which the most information is available. (See chap. I.) The company's "life-of-mine" plan, scheduled to end in 2017, is analyzed to the extent possible.

METHODS AND STUDY AREAS

For each topic in the EIS, the methods of analysis and the boundaries of the lands studied often differ. The four most often mentioned boundaries are the permit boundary, the application boundary, the life-of-mine boundary, and the Tract III boundary (fig. IN-1).

The existing permit boundary includes all lands for which Westmoreland now holds a mining permit. The application boundary includes the lands covered in Westmoreland's current application (the 13-year plan). The life-of-mine boundary covers the lands Westmoreland expects to mine in the future. The Tract III boundary includes the lands for which Westmoreland holds coal leases from the Crow Tribe of Indians.

An additional area often mentioned is Big Horn County. For most purposes, this is the social sciences study area. Under some topics, descriptions extend to more distant areas.

The analysis of social science topics used a number of techniques, including field observation, interviews, surveys, and use of Mountain West Research's Planning and Assessment System (PAS) computer model for forecasts of population, employment, and income. For a complete description of the social science study, see appendix A.

The analysis of natural science topics also used a variety of techniques. Where pertinent, these methods are discussed in chapters II and III.

ALTERNATIVES UNDER CONSIDERATION

After evaluation of Westmoreland's application for approval to mine, DSL and DOI have analyzed five alternatives that treat the range of decisions available to the agencies.

1. Approve the Application as Proposed

The environmental impacts of approving the application as proposed are discussed in chapter III.

2. Reject the Application

DSL or OSM may reject an application that does not meet program requirements. The effects of rejection would be that the physical environment would remain as described in chapter II. The changes in the social and economic conditions that would result from application rejection are described in chapter IV.

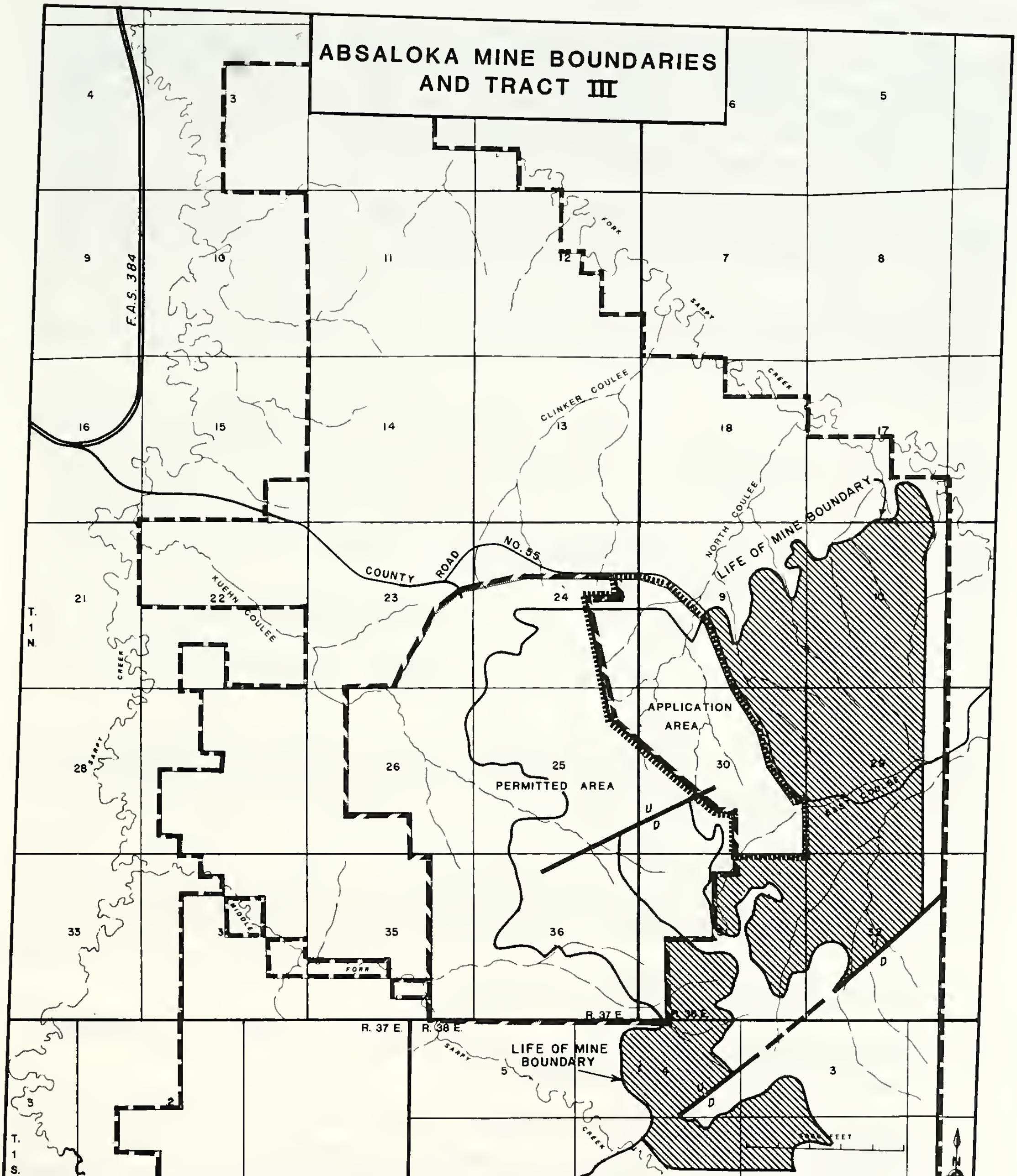


FIGURE IN-1

Boundaries most often mentioned in the EIS include Tract III (the Crow Indian coal lease) and the three boundaries in the mine area.

3. Selectively Rejecting Approval

DSL or DOI can reject approval for mining specified areas. The specified areas would include, for example, those having special, exceptional, critical, or unique characteristics, or where mining would affect the use, enjoyment, or fundamental character of neighboring land having the above special characteristics (82-4-227 MCA). The specified areas could also include those that could not meet state and federal reclamation standards.

Two areas have been recommended by the public for selective rejection. These recommended areas are analyzed in chapter IV. The first of these areas, option A, considers mining only the double-seam coal (Rosebud-McKay and Robinson seams). In this option, the part of the application area that contains only the Robinson coal seam would not be mined, leaving most of the North Coulee drainage within the application area undisturbed (fig. IV-1). As a result, this option would disturb only 432 acres, whereas the proposal would disturb 573 acres.

The second selective rejection area, option B, considers a level of mining within the application area that would have the least effect on North Coulee's most important wildlife water sources (springs 5, 8, 11, and 12). In this option, the single Robinson coal seam and portions of the Rosebud-MaKay coal seam adjacent to the North Coulee would not be mined, thus leaving a greater portion of the North Coulee drainage undisturbed (fig. IV-2). Only 270 acres would be disturbed in this option.

4. Approve Mining with Special Conditions (Preferred Alternative)

If parts of the proposed plan are considered unacceptable, DSL and DOI can approve mining with special conditions. Modifications identified in this EIS that would reduce the impacts of the mine are listed as separate sections at the end of each subject in chapter III. These sections are titled "Mitigating Measures." The agencies have selected six special conditions for the preferred alternative. These conditions would require the company to--

(1) Replace original acreages of ponderosa pine forest.

(2) Increase pine planting rates in small areas (together totaling 30 acres) to accelerate development of closed-canopy ponderosa pine forest.

(3) Replace today's acreages of drainage bottom vegetation types (deciduous trees and shrubs and aquatic vegetation).

(4) Seed drainage-bottom grasses (app. E) around the parts of impoundments that do not support aquatic vegetation.

(5) Construct fenced overflow ponds at the two proposed stock tanks in the application area.

(6) Construct fences that limit cattle access around the two proposed permanent impoundments.

5. No Action

The no-action alternative was evaluated by OSM and determined not to be reasonable because the company has fulfilled the requirements of its federal lease and has filed a complete permit application with OSM. Therefore, a decision by the Secretary of the Interior regarding approval of the mining plan and issuance of a federal permit to mine coal is required by law. However, for OSM, the impacts to the human environment of implementing the no-action alternative would be the same as those of rejecting the application. Thus, for the purpose of this EIS, these alternatives are considered equivalent and the no-action alternative is not analyzed further.

COMPARISON OF ALTERNATIVES CONSIDERED

The alternatives would have sharply differing impacts in six subject areas. The preferred alternative and application plan would result in the most coal mined, the greatest land disturbance, and the most taxes and royalties paid. Coal production, land disturbance and taxes and royalties would be less for option A, even less for option B, and zero for application rejection.

Application rejection would result in the least impact to water sources, wildlife habitat, and land use. Option B would yield fewer water sources, and less undisturbed forest and shrub wildlife habitat. The amount of rangeland would increase and cropland would decrease. Option A would result in the same number of water sources as option B, but the amount of undisturbed forest, shrub, and riparian wildlife habitat would be smaller. The land use areas in options A and B would be similar.

The application plan and preferred alternative would yield the same number of postmining water sources, although one to three fewer than the other alternatives. Postmining wildlife habitat resulting from the preferred alternative would have forest, shrub, and riparian acreages similar to the acreages resulting from application rejection, whereas the application plan would yield less acreage of each type. No cropland would be replaced in either the application plan or the preferred alternative. Land use acreage for both alternatives would be similar to options A and B. (For further information on alternatives, see chapter IV.)

OTHER ALTERNATIVES

Technical Alternatives

DSL and OSM also considered alternative ways of mining the coal at the Absaloka Mine, but the other methods are either impractical or inferior to the proposed dragline strip-mining operation proposed by Westmoreland. As a result, no alternative mining methods have been analyzed in detail in this EIS. Alternative mining methods considered but rejected include auger mining, underground mining, and truck-and-shovel mining.

Although practiced in some nearby mines, truck-and-shovel mining has one major drawback: higher cost. Where the topography is rolling and dissected, or where the company must selectively handle toxic overburden, truck-and-shovel mining may be preferred, despite the cost. At the Absaloka Mine, neither the topography nor the overburden would give truck-and-shovel mining an advantage.

Underground mining has several disadvantages. Although an underground method would not disturb the soil and rock strata overlying the coal, the land surface could subside after mining, as the underground mine workings collapsed. The resulting depressions and holes would limit land use for livestock grazing. A further problem might be underground coal fires, which can start when unextracted coal is exposed to air. Such fires can burn for years, despite repeated efforts to extinguish them. Underground mining also recovers considerably less coal than strip mining: the most efficient techniques recover about 80 percent, compared to the over 87.5 percent Westmoreland expects to recover.

Auger mining could be used in conjunction with strip mining to recover additional coal in highwalls and along outcrops. In highwalls, for example, the auger could bore into the coal seams beyond the economic limit of overburden removal for coal stripping. Auger mining, in this case, would not replace strip mining, but would be used as a minor supplement to the strip-mining methods already proposed.

Auger mining, like underground mining, has two drawbacks. The holes left by the auger would be costly and difficult to seal. In addition, the company would recover less than 50 percent of the coal, leaving the remaining coal unrecoverable by conventional techniques.

WESTMORELAND RESOURCES' ABSALOKA MINE

WESTMORELAND'S PROPOSAL

Westmoreland Resources Inc. has revised its long-range plan for mining at the Absaloka Mine in Big Horn County. The revised plan calls for two changes from the 20-year plan evaluated in the 1977 U.S. Geological Survey and 1979 Department of State Lands EISs. The first is a change in the sequence and timing of mining over the next thirteen years. Westmoreland has submitted this change, in detail, in a new permit application package (fig. I-1).

The second change would enlarge the entire area scheduled for mining, an area that would be worked until 2017, the year the mine would close (assuming two years for reclamation) (fig. I-2). For this life-of-mine area no detailed plans are available. Westmoreland would submit detailed plans as it applies for future approvals to mine.

The Absaloka Mine lies between the main fork and East Fork of Sarpy Creek, about 26 miles east of Hardin, Montana, via FAS 384 and County Road 55. The company opened the mine in 1972 and since then has expanded the mine acreage steadily. Currently, 2,630 acres are under permit.

In the application Westmoreland has submitted, the company proposes to add 629 acres to the permitted area. Of this, 573 acres would be disturbed by mining over 13 years (fig. I-1). Mining in the new area would begin in 1985. In the life-of-mine plan, the company would add another 2,096 acres, bringing the total mine area to about 5,355 acres (fig. I-2).

The existing mine covers all or part of sections 23, 24, 25, 26, 35, and 36 of T1N, R37E and sections 30 and 31 of T1N, R38E. Westmoreland's proposal would extend the mine in sections 24 and 25 T1N, R37E and sections 19 and 30 T1N, R38E (fig. I-1). The life-of-mine plan would further extend the mine in sections 17, 19, 20, 29, 30, 31, and 32 T1N, R37E and sections 3 and 4 T1S, R38E (fig. I-2).

Westmoreland has designed the Absaloka Mine to produce up to 10 million tons of coal per year. Owing to the soft coal market, however, the mine now produces only 4 million tons per year. No increase is expected within the near future, probably not until the late 1980s. At today's production rate, the mine could operate long after 2017.

For planning purposes, the company proposes to mine an average of 5 million tons per year until 1987. Production would then grow, rising to 10 million tons per year by 1992 and remaining there through the life of the mine (table I-1). If the coal market improves, the company would raise the production rate earlier than 1987. Coal production rates would then vary, reaching a maximum of 10 million tons per year (the same maximum proposed in the former 20-year plan). Figure I-2 depicts this more optimistic schedule.

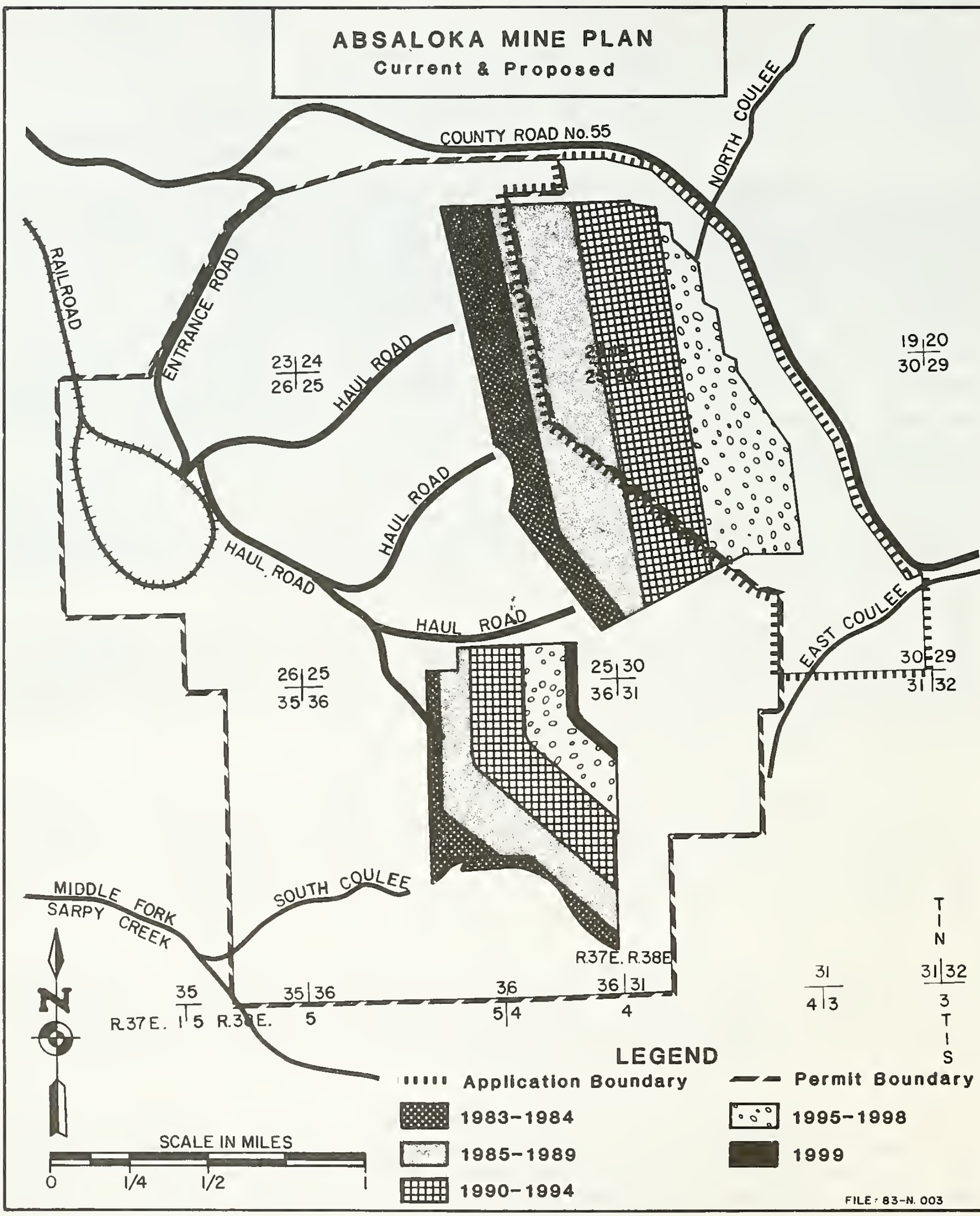


FIGURE I-1

Plans call for the dragline to advance eastward, moving by 1985 into the new 629-acre application area. The lands between the cuts shown and the facilities area have already been mined.

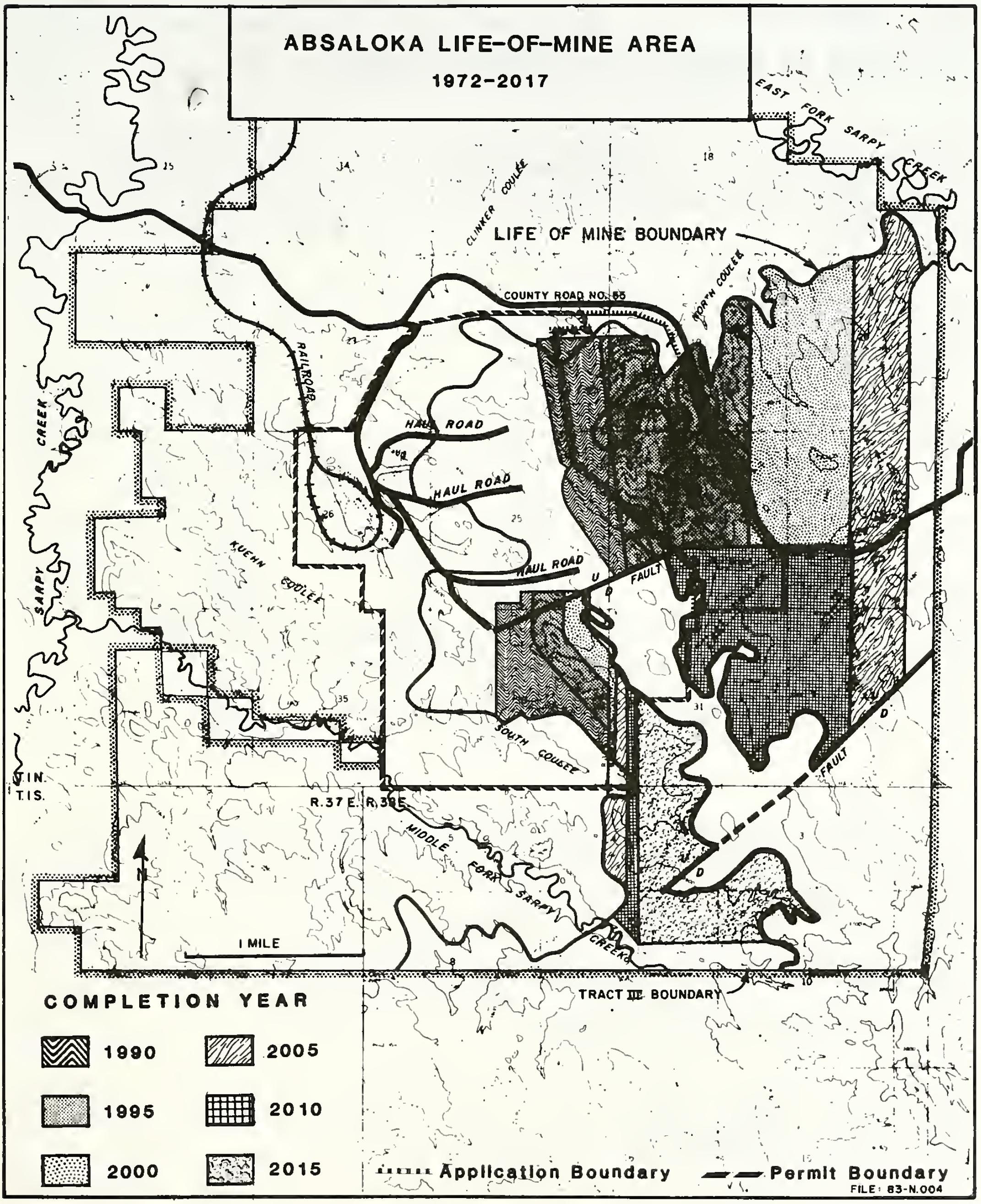


FIGURE I-2

Over the next 34 years, Westmoreland hopes to mine both the application and life-of-mine areas. The company would not mine lands that have more than 150 feet of overburden over the coal.

TABLE I-1

Past and Proposed Absaloka Mine Coal Production

Year	Permit Application Coal Production (millions of tons)	Life-of-Mine Coal Production (millions of tons)
1974	1.5	1.5
1975	4.0	4.0
1976	4.1	4.1
1977	4.5	4.5
1978	4.5	4.5
1979	5.0	5.0
1980	4.9	4.9
1981	4.5	4.5
1982	4.2	4.2
1983	3.5	3.5
1984-1987	5.0	5.0
1988-1989	5.0	6.0
1990-1991	5.0	8.0
1992-1997	5.0	10.0
1998-2014	0	10.0
TOTAL	110.7	318.7

Note: To date, 40 million tons of coal have been produced. An additional 278 million tons would be produced over the life of the mine.

Source: David W. Simpson, Absaloka Mine General Manager, written commun., September 6. 1983.

Before mining the application area, Westmoreland Resources would have to increase the reclamation bond covering the permit area. For the 3,225-acre permit area including the application area, Westmoreland would bond a total of 2,347 acres for mining-level disturbance, 221 acres for facility-level disturbance, and 657 acres for associated disturbance. (Mining-level disturbance includes mining and overburden stockpiles; facility-level disturbance includes haul roads, access roads, sediment ponds, the railroad loop and siding, and mine facilities; associated disturbance includes topsoil stockpiles, ditches, fences, and other minor disturbances.)

COAL RESERVES AND PRODUCTION

Four coal seams underlie the Absaloka Mine. From top to bottom these include the Stray 1, Rosebud-McKay, Stray 2, and Robinson. The Stray seams are thin, discontinuous, and often of poor quality. Westmoreland would mine these seams only when they are recoverable and marketable. The Stray seams each reach a maximum of 5 feet in thickness.

Westmoreland's primary objective is to mine the Rosebud-McKay and Robinson seams. The Rosebud-McKay is 30 to 35 feet thick and lies under 70 to 135 feet of overburden. The Robinson seam, 50 to 100 feet below the Rosebud-McKay, varies from 17 to 23 feet in thickness. Recoverable coal reserves remaining at the Absaloka Mine total about 278 million tons.

Westmoreland now sells coal from the Absaloka Mine to utilities in the northern Midwest for use in coal-fired electric generating plants (table I-2). In the future, the company would market coal to both northern Midwest and Pacific Northwest utilities.

TABLE I--2

Absaloka Mine Coal Sales
(in thousands of tons)

Company	1978	1979	1980	1981	1982	1983*
Northern States Power Co.	2,550	2,950	3,000	2,900	2,700	2,450
Dairyland Power Cooperative	455	500	500	500	500	450
Interstate Power Co.	305	250	250	300	300	200
Wisconsin Power & Light Co.	200	240	290	170	150	150
Central Illinois Light Co.	770	700	520	240	200	200
Upper Peninsula Generating Co.	175	280	270	270	230	250
Spot Market	98	33	81	78	50	50
TOTAL	4,553	4,953	4,911	4,458	4,130	3,750

Source: David W. Simpson, Absaloka Mine General Manager, written commun., November 19, 1982
* estimated

The State of Montana owns the coal in section 36, T1N, R37E. The rest of the coal in the mine area is leased by Westmoreland from the Crow Tribe of Indians.

MINE FACILITIES

Westmoreland would continue to use the facilities that now service the mine (fig. I-3). Coal-processing structures include a truck dump, primary crusher, secondary crusher, train loadout, and coal storage barn. These facilities can handle 11 million tons of coal per year. Other facilities include an office, shop, change house, boiler house, equipment storage building, repair shop, water treatment plant, coal testing laboratory, and explosive (ammonium nitrate) storage silo.

FIGURE I-3

Facilities used by the mine today (encircled by the railroad) would not be changed. As the mine pits advance away from the facilities area, haul roads would be lengthened.

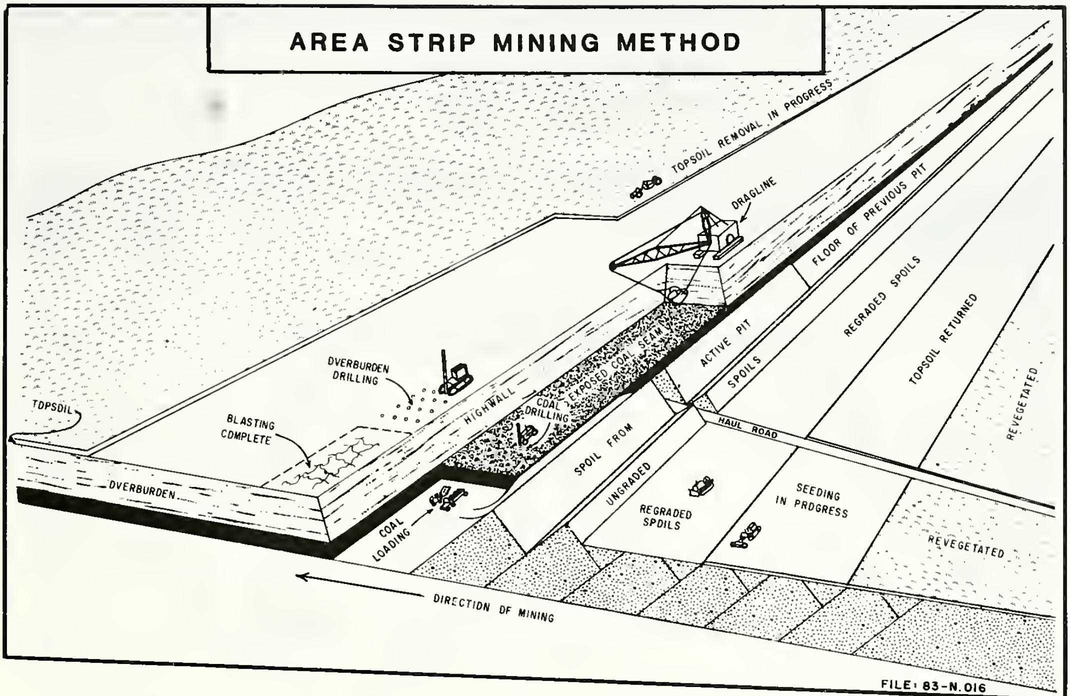


FIGURE I-4

Mine "pits" are actually long troughs cut by the dragline. One pit is cut at a time, the unwanted overburden goes into the mined-out cut. (Note that for simplification only one coal seam is shown in the sketch.)

MINING METHOD

The Absaloka Mine is an area strip mine, where the dragline advances by excavating a succession of long, narrow pits, one alongside the next. Mining has and would continue to move from west to east (fig. I-1).

Mining first begins when scrapers strip the topsoil and subsoil from the surface, keeping the topsoil separate from subsoil (fig. I-4). The dragline then strips the unwanted strata, or overburden, down to the Rosebud-McKay seam. An electric-loading shovel excavates the Rosebud-McKay seam. The parting between the Rosebud-McKay and Stray 2 seams is removed with dozers, and the Stray 2 seam is then removed with a front-end loader. The dragline then strips the remaining interburden, and the electric-loading shovel removes the Robinson seam.

While cutting each new strip, the dragline casts excavated overburden into adjacent strips. After the mined-out strips are filled, bulldozers contour the surface to approximately the premining topography. (See. figs. I-5 and I-6.) Scrapers then replace the subsoil and topsoil and the area is

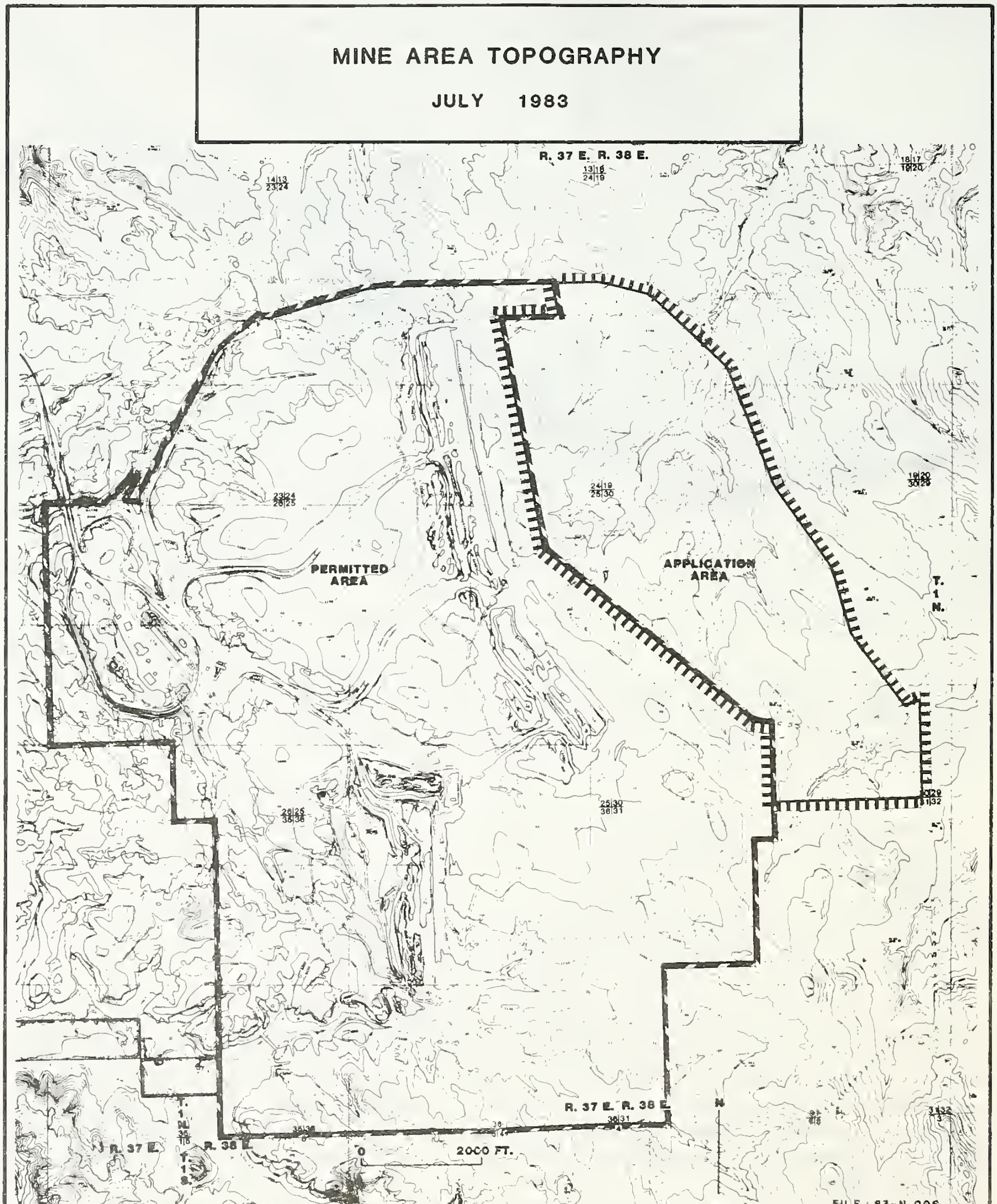


FIGURE I-5

Shown in the figure is today's topography, typified by rolling rangeland and rounded hills. Most of the permitted area topography has been reconstructed after mining. Application area contours are natural.

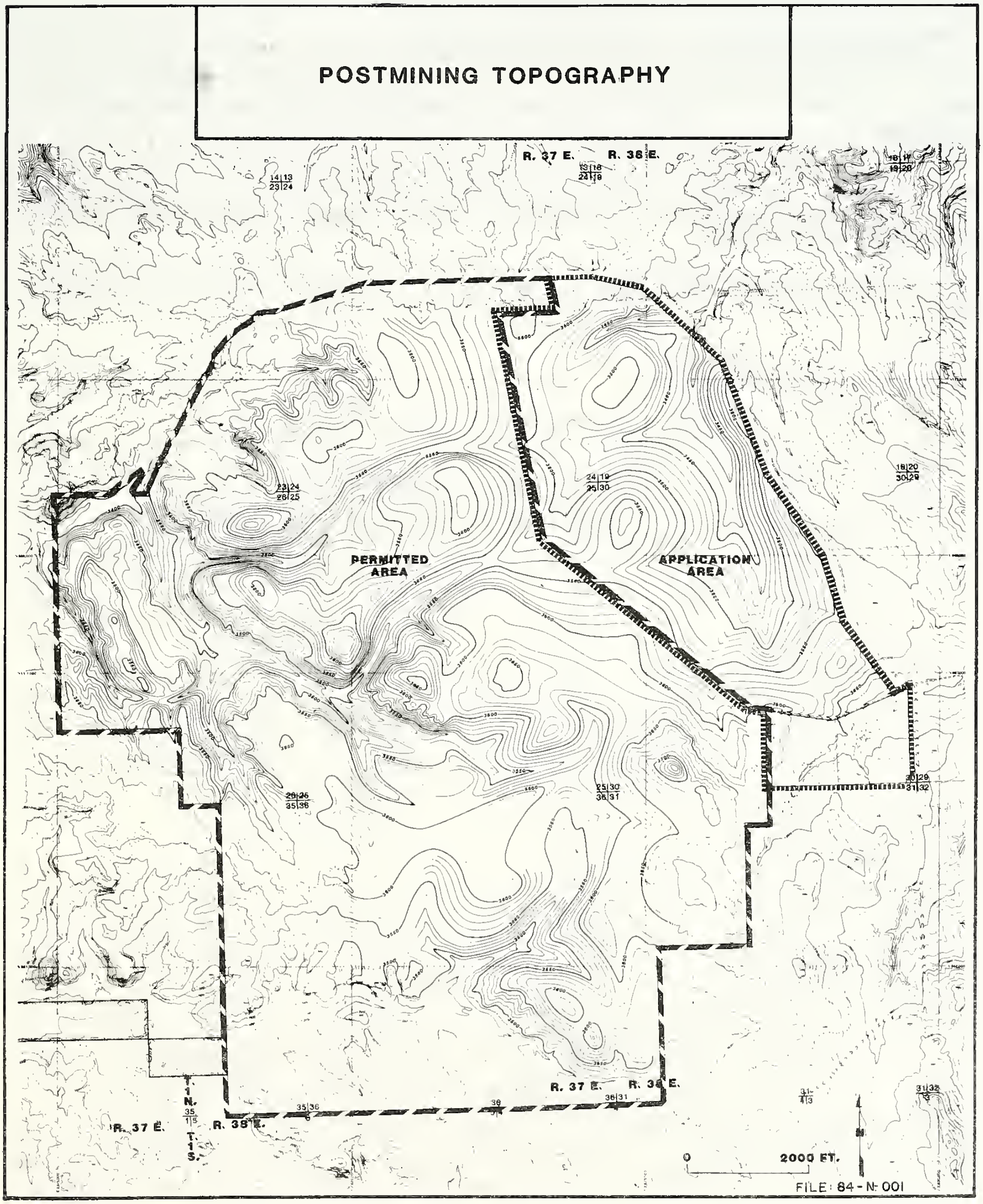


FIGURE I-6

Bulldozers would regrade the excavated overburden (spoil) into the approximate topography and drainage patterns that existed before mining.

reseeded. This completes the reclamation process. In this way, only part of the total mine area is actually cut by a mine pit at one time.

Following a period of plant establishment, most reclaimed lands are returned to the primary premining land use--livestock grazing and wildlife habitat. To date, 276 acres have been revegetated, but no bonds have been released.

EMPLOYMENT AT THE MINE

The mine now employs 120 workers. Table I-3 lists past and projected employment.

TABLE I-3

Past and Projected Employment at the Absaloka Mine

Year	Hourly Employees	Salaried Employees	Total Employees
1979	145	52	197
1980	134	51	185
1981	114	50	164
1982	87	45	132
1983	80	45	125
1984	80	40	120
1985	80	40	120
1986	80	40	120
1987	100	45	145
1988	140	50	190
1989	140	50	190
1990	175	55	230
1991	175	55	230
1992-2014	210	55	265
2015-2017	45	5	50

Source: David W. Simpson, General Manager of Absaloka Mine, written commun., November 19, 1982

DESCRIPTION OF THE EXISTING ENVIRONMENT

The analysis of Westmoreland's application and life-of-mine plans in this EIS covers a number of subjects, representing the "environment" of the Absaloka Mine today. This environment encompasses the resources, enterprises, services, facilities, and people that could be affected by the project.

GEOLOGY

Topography and Geomorphology

The application area generally lies east of the drainage divide between the East and Middle Forks of Sarpy Creek. The divide is a gently rolling surface, about 1/4 mile wide, drained by ephemeral tributaries to the two forks of Sarpy Creek. Topographic relief reaches a maximum of 300 feet within Tract III. Tributaries draining northward to the East Fork occur as vegetated coulees and vary in length up to about 2 miles. The southeastern corner of Tract III drains both north, toward the East Fork of Sarpy Creek, and southwest, toward the Middle Fork.

Evidence of accelerated erosion is generally absent. Dominant erosional processes active today include rainsplash, wind erosion, and sheet and rill wash. Significant channel erosion has not been observed, due largely to relatively coarse soils, low surface gradients, and good vegetative cover, all of which promote low runoff and high infiltration rates.

Structure and Stratigraphy

Regionally, Tract III is located in the northern part of the Powder River Basin. Strata in the area strike northwest and dip gently east and northeast 3 to 5 degrees. On Tract III, some local structural depressions are evident which trend northeast and appear to be related to faulting. The amount of offset in these structural features is minor, as evidenced in cuts now exposed in the mine. The most prominent feature identified in the Tract III area is a structurally low area in the northern portion of section 36 (Montana Department of State Lands, 1977).

The entire application area is underlain by the Tongue River Member of the Fort Union Formation, which contains all of the coal seams of economic importance in the area. The Tongue River Member mainly comprises variegated siltstone, mudstone, shale or claystone, and interbedded sandstone layers.

Two coal seams of economic importance in the Tongue River Member--the Robinson and the Rosebud-McKay--are preserved in this area. The lower of the two seams, the Robinson, is about 20 feet thick, and the higher, Rosebud-McKay, about 30 feet thick. Two stray seams, each 3 to 5 feet thick, are present locally above and below the Rosebud-McKay seam. All younger and stratigraphically higher coal seams have been removed by erosion (fig. II-1).

Shale and siltstone constitute most of the overburden and about half the interburden southeast of the structural low in section 36. Claystone or shale immediately underlies both coal seams. Sandstone forms most of the lower part of the member below the Robinson seam. Northwest of the structural low, sandstone layers are distributed more uniformly throughout the member, and underlie most of the land surface. There, too, the coal seams are immediately underlain by impermeable shale or claystone.

Coal Resources

Of the 825 million tons of coal underlying Tract III, Westmoreland Resources indicates that about 325 million tons comprise the minable reserve base. (This section is adapted from Westmoreland's permit application [Westmoreland Resources, 1983].). However, because areas with more than 150 feet of overburden cover are currently uneconomical to mine, the recoverable coal reserve is approximately 278 million tons. (The 20-year mine plan approved by the Department of the Interior in 1977 envisioned the extraction of 190.6 million tons by 1997, in addition to the 5.5 million tons mined through 1975 from the existing mine.)

Westmoreland now extracts between 3 and 5 million tons per year, although the mine can produce a maximum of 10 million tons per year. The coal is classed as subbituminous "B", has an average heating value of 8,450 Btu/lb, and contains 0.73 percent sulfur (Montana Department of State Lands, 1977).

Overburden

Overburden in the application area is typical of southeastern Montana. The average thickness of the overburden is 83 feet and the interburden 61 feet. (Overburden, as used in this text, is the material above the Rosebud-McKay coal seam, excluding the thin and often nonexistent Stray 1 seam; the interburden is defined as the parting material between the Rosebud-McKay coal seam and the Robinson seam, excluding the thin Stray 2 seam, which is also often nonexistent.)

Overall, the overburden has a slightly alkaline pH and is low in salinity and sodicity. The interburden also has an alkaline pH and is low in salinity. Unlike the overburden, however, the interburden is generally sodic. Textures of the overburden and interburden are usually clay loam to silty clay loam, but range from clay to loamy sand. Most trace element levels are low--an exception to this is molybdenum which is slightly elevated in a number of drill cores. Based on application area saturation percentages (water-holding capability), swelling clays do not appear to be present in significant quantities in either the overburden or interburden.

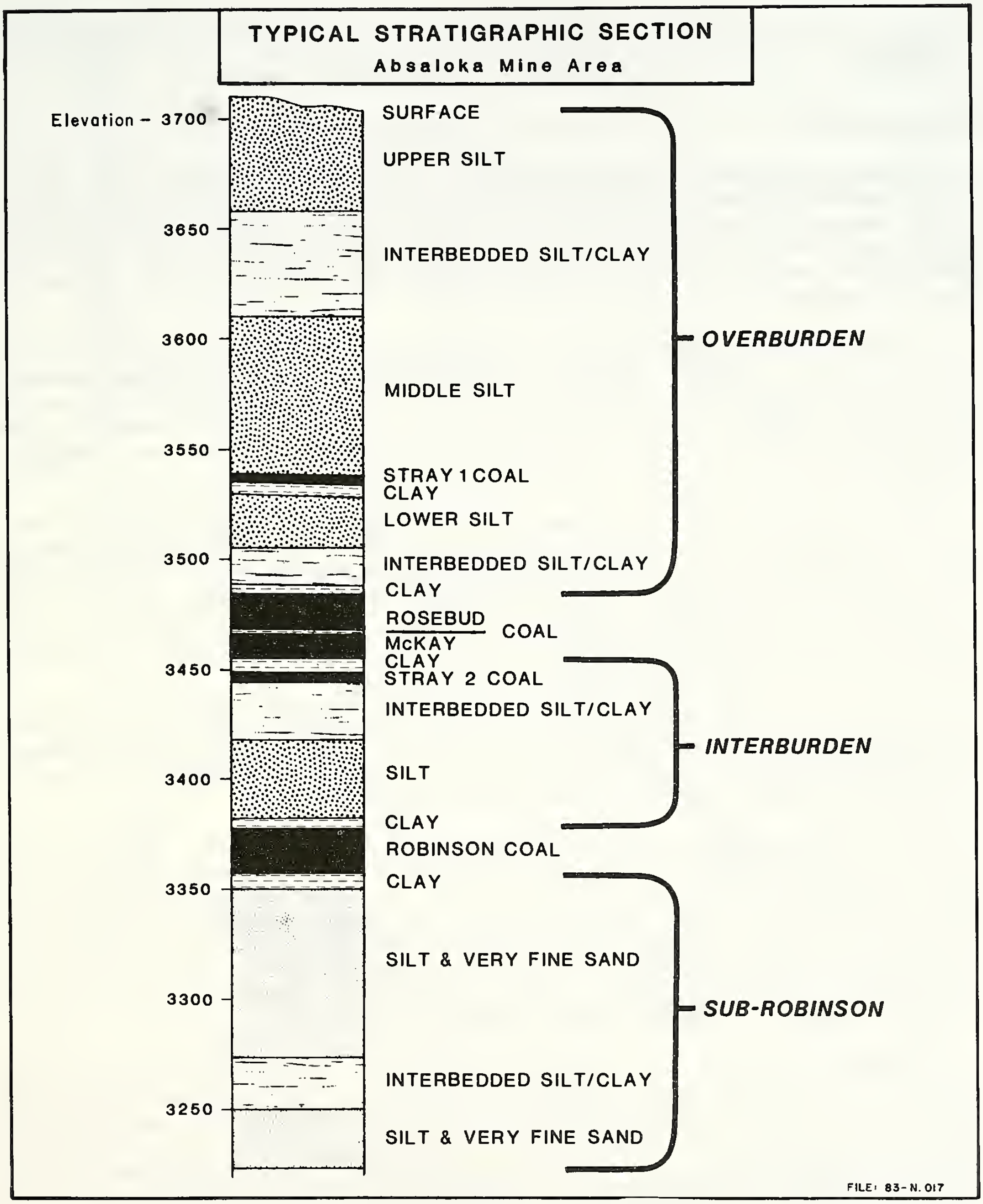


FIGURE II-1

Stratigraphy in the mine area is relatively uniform, made up of the Tongue River Member of the Fort Union Formation. The coal seams mined by Westmoreland include the Rosebud-McKay and Robinson.

HYDROLOGY

Surface Water

No perennial streams lie within Tract III. Surface water flows along interrupted ephemeral reaches within tributary coulees, and along short segments below several perennial springs. All surface water drains toward the East Fork, Middle Fork, or the main stem of Sarpy Creek (fig. II-2). East Fork and Middle Fork drain into the main stem of Sarpy Creek which, in turn, drains to the Yellowstone River.

Current mining operations are disturbing the watershed of all three forks of Sarpy Creek. However, because of Westmoreland's current drainage control plan and sedimentation impoundments, mining operations since 1974 have had no discernible impact on the surface water of the Sarpy Creek basins. The application and life-of-mine areas would both increase disturbances, primarily in the coulees that flow to the East Fork of Sarpy Creek.

The drainage area of the East Fork of Sarpy Creek above its confluence with Sarpy Creek is 81.6 square miles (about 52,000 acres). The application area contains 629 acres, or 1 percent, of the East Fork basin. The life-of-mine plan area contains another 2,096 acres, or about 0.8 percent, of the entire Sarpy Creek basin. Westmoreland would eventually disturb a total of 5,355 acres, or less than 2 percent of the total Sarpy Creek basin, although not all of this would be disturbed at the same time.

Records of the U.S. Geological Survey (Water Year Reports, 1974-82) indicate that the annual runoff from the Sarpy Creek drainage basin averages about 12 acre-feet per square mile (table II-1), although this varies greatly from year to year, sometimes by more than tenfold.

The most important surface water features within Tract III are the numerous springs located within several coulees that drain to the East Fork of Sarpy Creek (fig. II-2 and table II-2). At least 19 springs lie within the life-of-mine area. Eight springs occur in the application area (table II-3). All are the surface expression of a complex ground water system. The springs issue mainly from the Rosebud-McKay overburden, clinker, and alluvium and colluvium in the coulee bottoms. (See Ground Water.) Water from the springs is used heavily by livestock during the grazing season.

The springs (such as spring number 9; table III-3) at the heads of the coulees have small flows of less than 1 gallon per minute (gpm), whereas the two largest springs in North Coulee (numbers 8 and 12) discharge up to 18 gpm, depending upon the weather and season. Discharge rates of all springs have decreased since 1979, apparently due to drier climatic conditions. The smallest springs generally cease flowing during fall and winter, when the flows of the largest springs generally decrease. Only three of the springs, numbers 5, 8 and 12, are considered perennial water sources for livestock and wildlife.

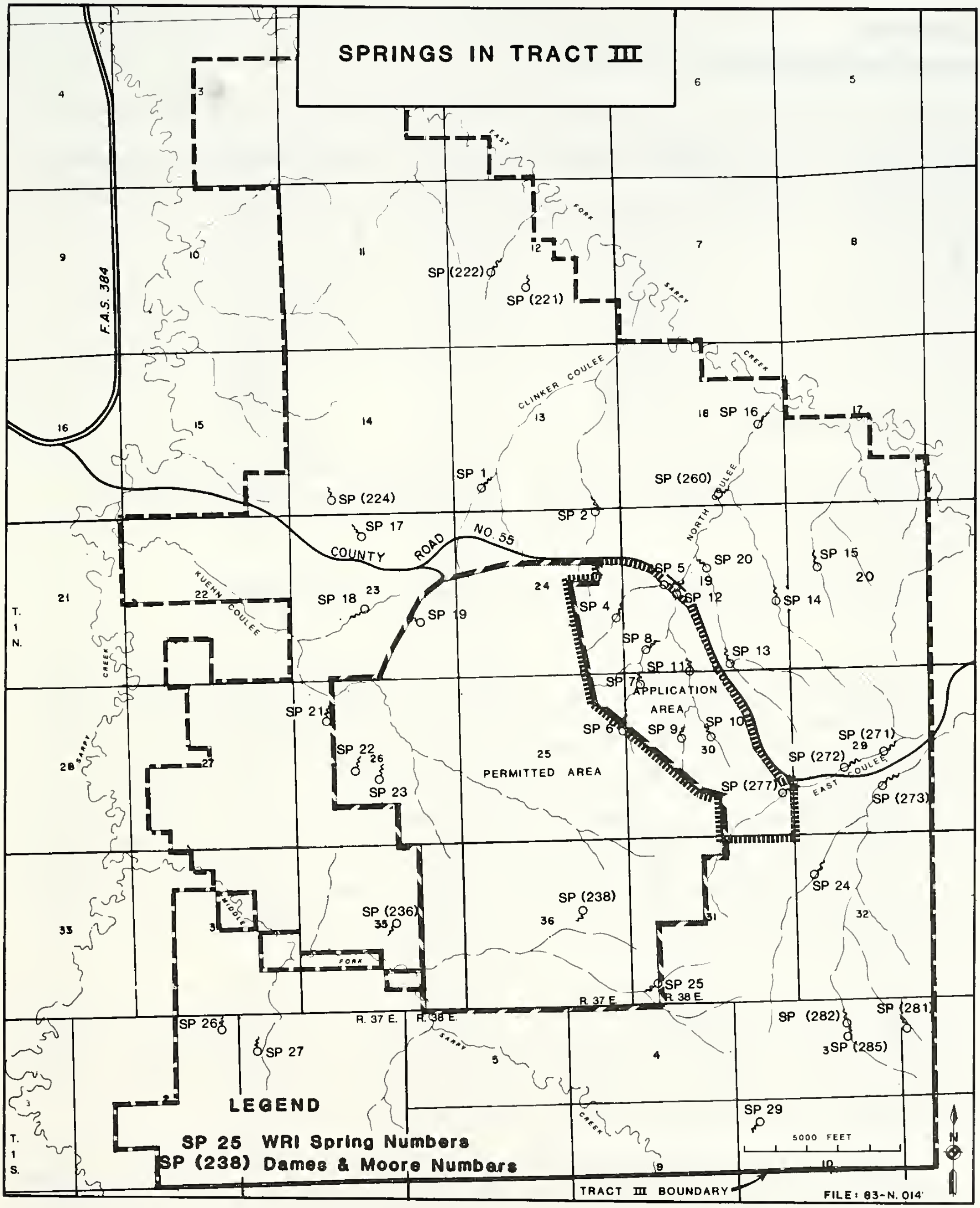


FIGURE II-2

Springs in Tract III often occur as isolated pools in coulee bottoms. The two largest springs in the application area are numbers 8 and 12. (Spring 3, which flowed temporarily in 1979 but has been dry since, is not shown. Nor is spring 28, which lies in the southwest corner of Tract III and is not in the application area.)

TABLE II-1

Sarpy Creek Discharge

Water Year	Total Runoff[1]	Unit Runoff[2]
1974	2,010	4.4
1975	14,570	32.2
1976	1,580	3.5
1977	1,870	4.1
1978	10,450	23.1
1979	11,780	26.0
1980	1,450	3.2
1981	1,100	2.4
1982	4,320	9.5
9-Year Average	5,459	12.1

Source: U.S. Geological Survey Water Year Reports, Montana, 1974-1982.
Note: Measured near Hysham, Montana. Drainage area is approximately 453 square miles.

[1]Values in acre-feet.

[2]Values in acre-feet of runoff per square mile of drainage area.

The springs occur primarily as isolated discharges or seeps along coulee bottoms where the underlying water table is close to the ground surface. Most have been improved by ranchers to make the water more readily available to livestock. The improvement generally has been made by excavating in the coulee bottoms to intercept the ground water table. The springs flow for short, variable distances down the coulee before the water infiltrates into the coulee bottom. No evidence of continuous, active surface water channels exists anywhere in the coulee systems draining northeast from the application area. This indicates that channeled runoff in this vicinity contributes little to the flows of the East Fork of Sarpy Creek. Table II-3 provides a brief description of the ten springs which would be affected by mining within the application area.

A review of 176 townships covering the Fort Union coal region of southeastern Montana indicates that the townships of Tract III probably do not contain a greater density of springs, or springs of significantly better water quality, than do other comparable areas within the region (Westech, 1977). Water quality analyses of samples taken from spring flows in Tract III indicate that the water quality is about average for southeastern Montana.

Areas of high spring density within the region tend to be located next to uplands, such as the Wolf and Little Wolf Mountains, and in the Ashland District of Custer National Forest. This suggests that the scale of comparison is the single most important factor in any statement concerning the density of springs in Tract III. The density of springs per unit area in Tract III is possibly significantly greater than in eastern Montana as a whole.

TABLE II-2

Selected Data for Tract III Springs

Spring number[a]	Water Source[b]	Elevation (feet)[c]	Measured or Estimated flow(gpm)	Specific Conductance (umhos/cm)[d]
1	rmcl	3,430	0-7.0	1,900-2,500
2	rmcl	3,410	0-2.3	1,860-2,250
4	Ttrl	3,455	0-5.4	1,000-2,480
5	rmcl and Q	3,440	0-3.8	1,850-5,160
6	Ttrl	3,560	0-0.8	1,090-2,130
7	rmcl	3,465	0-3.8	1,350-3,710
8	rmcl	3,445	0-14.1	1,150-3,060
9	Ttrl	3,550	0-0.1	1,270-1,510
10	Ttrl	3,510	0-2.5	1,020-1,790
11	Ttrl	3,460	0-2.2	1,630-2,530
12	rmcl and Q	3,405	0-18.0	1,190-2,150
13	Ttrl	3,468	0-2.9	908-4,000
14	Ttrl	3,460	0-1.4	1,220-1,280
15	Ttrl	3,460	0	1,050-1,080
16	Q	3,320	0	2,800
17	rmcl	3,450	0	3,600
18	rmcl	3,430	0.05-0.38	2,100
19	rmcl	3,450	0	1,200-2,900
20	Q	3,400	0	1,360
21	rmcl	3,400	0-9.38	4,400
22	rmcl	3,480	0-0.04	3,300
23	rmcl	3,540	0	1,900
24	Ttrl	3,510	0-0.58	1,320-2,270
25	Ttrl	3,540	0	780-848
26	U	3,540	0	1,160
27	U	3,470	0-0.03	850
29	Ttrl	3,560	0	1,060
221	rmcl	3,430	0	1,060
222	Q	3,365	0-0.008	6,000
224	rmcl	3,420	0-1.1	4,300
236	U	3,435	0-1.5	2,600
238	Ttrl	3,477	0-0.2	1,220-1,640
260	Q	3,360	0-5.8	2,480
271	Ttrl	3,460	0-0.14	1,400-1,670
272	Ttrl	3,470	0-0.13	1,340
273	Ttrl	3,465	0	2,800
277	Ttrl	3,520	0-1.7	1,670-2,320
281	Ttrl	3,650	0-0.4	2,200
282	Ttrl	3,575	0	1,020
285	Ttrl	3,615	0-2.5	2,800

Source: Montana Department of State Lands, 1979; Westmoreland Resources, 1983.
[a]Spring number indexed to locations shown on fig. II-2
[b]Source: Q=Quaternary alluvium or slope wash; Ttrl=Tongue River member above Rosebud-McKay coal; rmcl=Rosebud-McKay clinker; U=undetermined.
[c]Estimated from U.S. Geological Survey and Westmoreland Resources maps, 1983.
[d]Values shown are lab measurements.

TABLE II-3

Characteristics of Springs Affected by Mining in the Application Area

Spring Number	Description
4	Occurs in the coulee bottom as a small pond behind a small impoundment structure.
5	Occurs in a small headcut in the coulee bottom and from the north bank. Improvements have been made to allow flow to fill a stock tank, which apparently is a perennial water source. This spring was also previously identified as 261.
7	Occurs as a large shallow depression behind a small constructed impoundment. Contained water in 1979, but was dry in August 1983.
8	Discharges partially from a small stand of trees in the coulee bottom and from the coulee's west bank. Two ponds have been constructed to provide an apparent perennial water source.
9	Occurs as seepage from the coulee bottom. A minor impoundment has been built below the spring. It is dry most of the time.
10	Occurs as seepage from the coulee bottom and has been improved by installing several catchments of approximately 50 gallons, which frequently contain water even when the coulee bottom is dry and seepage is not observed.
11	Discharges from a headcut into a small pool and then to several large ponds down the coulee. Contained water in 1979, but was dry in August 1983.
13	Occurs outside the application area as seasonal seepage from a headcut in the creek bottom. Standing water has been observed below the seepage area.
12	The largest spring in North Coulee, it occurs from a headcut in the coulee bottom. A pool below the headcut has been deepened for stock improvement. It is a perennial water source just outside the application area.
277	Occurs as seepage from the bottom of East Coulee. It is in the associated disturbance part of the application area, which is not proposed for mining.

Note: Spring 6 probably already has been affected and would be removed by mining in the permitted area. Refer to fig. II-2 for spring locations.

Part of the combined perennial flow of some of the springs and the associated ground water flow within the coulees ultimately contributes to ground water flow within the East Fork of Sarpy Creek valley. Data provided by Westmoreland, however, suggest that most of this water is consumed by evapotranspiration before it ever reaches the East Fork.

The drainage that would be most affected by mining is North Coulee, a tributary to East Fork of Sarpy Creek. Data submitted by Westmoreland suggest that surface water from North Coulee contributes less than one percent of the flow in the East Fork of Sarpy Creek. The predominance of clinker deposits in the coulee are not conducive to providing surface runoff.

Field observations and data provided by Westmoreland indicate that nearby portions of the Sarpy Creek system may meet criteria for alluvial valley floors under Montana and federal strip mine laws. No areas identified as potential alluvial valley floors are included within the application or life-of-mine areas.

Ground Water

Several separate ground-water-bearing zones lie within the application area: alluvium and colluvium within the coulees, Rosebud-McKay overburden, Rosebud-McKay clinker, Rosebud-McKay coal, Robinson coal, and sub-Robinson aquifer. Other aquifers, including the Madison Limestone from which Westmoreland gets most of its industrial purpose water, lie at greater depths. Ground-water-bearing zones and aquifers stratigraphically below the Robinson coal have not been affected by mining.

The most important ground-water-bearing units in the immediate mine vicinity are the alluvium and colluvium underlying the coulees draining the mine area (fig. II-2), the Rosebud-McKay overburden, and the Rosebud-McKay clinker. These units support the numerous springs within the coulees draining the mine area. The coulees transmit both ground and surface water toward the Middle and East Fork of Sarpy Creek. The coulees receive recharge by at least three primary means. Point source recharge to the coulees occurs from springs issuing from both the Rosebud-McKay overburden and from adjacent clinker. Less direct but possibly equally as important recharge occurs by subsurface flow from both the overburden and the clinker. The most important means of recharge to the coulees appears to be snowmelt. The relationships between ground and surface water flow within the coulees results in a water table close to or at ground surface.

In Tract III the Rosebud-McKay overburden comprises three separate parts, termed by Westmoreland Resources as the upper, middle, and lower silts (fig. II-1). The middle and lower silts underlie most of the northern and western portions of Tract III. The upper silt appears to be present only at higher elevations in the southeastern quarter of the tract. Although termed the upper silt, this unit is in places a fine-grained sandstone.

The overburden's hydrogeologic significance increases toward Tract III's southeastern corner. Recharge to the overburden within the vicinity of proposed mining area comes from local precipitation. Ground water movement

within the overburden is generally away from the local ground water divide. The divide nearly matches the surface water divide between the East and Middle Forks of Sarpy Creek.

The overburden discharges laterally to adjacent Rosebud-McKay clinker, to springs within coulees draining the divide, and to a much lesser extent, to underlying Rosebud-McKay coal. The overburden is the sole ground water source for some of the small springs in the heads of coulees that flow to the Middle and East Forks of Sarpy Creek and is the source of some of the ground water moving down the coulees.

Another ground-water-bearing unit of importance is the Rosebud-McKay clinker. Part of the clinker unit underlies the life-of-mine area east of the drainage divide between the Middle and East Forks of Sarpy Creek. The clinker receives recharge at high rates from direct precipitation and snowmelt and, probably in lesser amounts, from adjacent overburden and unburned Rosebud-McKay coal. The clinker discharges through springs located within the coulees and by direct subsurface flow to the coulees. This unit probably contributes to much of the water flowing within North and Clinker Coulees.

At the upper end of the coulees, the base of the clinker underlies the surface of the alluvium and colluvium. Lower in the coulees, the clinker base is exposed, running along the coulees' sides, where vegetation demarcates the unit. This occurs because the coulee bottom's gradient is greater than that of the base of the clinker.

Because clinker is highly transmissive and allows ground water flow at relatively high rates, water storage in large amounts is unusual. This is particularly the case with small, free-draining clinker areas that have sharp contacts with underlying, less permeable bedrock units. The two largest springs in the main coulee system (numbers 8 and 12--see fig. II-2) probably receive a significant portion of their recharge from a small clinker area adjacent to the west bank of North Coulee. This conclusion is based partially on drilling in this small clinker area by Westmoreland in 1979. Drilling results revealed that the burn of the clinker is not complete: Much of the Rosebud-McKay coal seam is present beneath the clinker, although in an altered, weathered condition. These two large springs are also recharged by adjacent, upgradient alluvial and colluvial deposits.

The water-bearing coal seams within the mine area--the Rosebud-McKay and Robinson seams--allow little ground water movement through the mine area, especially when compared to the overburden, the clinker, or the unconsolidated coulee deposits. Collectively, the Rosebud-McKay and Robinson seams are of little importance to total ground water movement within the area.

North Coulee is the primary tributary to the East Fork of Sarpy Creek to be affected by proposed mining activities. Data presented in Westmoreland's application indicate that ground water flow in the coulee totals 10.3 acre-feet per year. In comparison, total ground water flow in the East Fork of Sarpy Creek alluvium has been calculated at 102 acre-feet per year. The Robinson coal, which subcrops to the East Fork alluvium contributes an estimated 0.4 acre-feet to the system annually.

Ground water within the application area is potable and suitable for most purposes. Numerous ground water quality data for the area have been reported (U.S. Department of Interior, 1976 and 1977; Montana Department of State Lands, 1977 and 1979; Westmoreland Resources, 1983). The location of much of Tract III on a drainage divide and the adequacy of good quality surface water supplies have resulted in relatively few wells in the immediate mine area (fig. II-3 and table II-4).

SOILS

The soils of the disturbance area vary in their depth, texture, color, profile morphology, and coarse fragment content. This diversity reflects the variability of topography, parent materials, vegetation, and past land uses.

A total of eight soil series and one unnamed soil type have been identified and placed into 11 mapping units in the proposed disturbance area. For ease of discussion, the soil mapping units have been divided into three major soil groups based on similarities in parent material and topographical position:

--Residual Soils
--Depositional Soils
--Drainageway Soils

The locations of these general soil groups within the disturbance area are shown on figure II-4. For a complete listing of the mapping units proposed for disturbance, as well as the amount of soil by unit proposed for salvage, see table III-2 in chapter III, Soils.

Residual Soils

The residual soils group covers about 84 percent of the disturbance area. The group consists of moderately deep and shallow soils that are developing in place over sandstone, shale, or porcelanite (clinker). The soils in this group are mildly alkaline and textures range from clay loam to sandy loam. Most of these soils contain coarse shale, siltstone, or sandstone fragments that increase in number with depth.

Common vegetation growing on the loam and clay loam soils in this group includes needle-and-thread, western wheatgrass, sideoats grama, broom snakeweed, and fringed sagewort. Plants associated with the sandier soils of this group include prairie sandreed, dryland sedges, silver sagebrush, green sagewort, and yucca. Within this group, the Cushman and Spearman soils formed from both shale and sandstone, the Thedalund soils formed from shale and siltstone, the Nelson soils formed from sandstone, and the Wibaux soils formed from porcelanite.

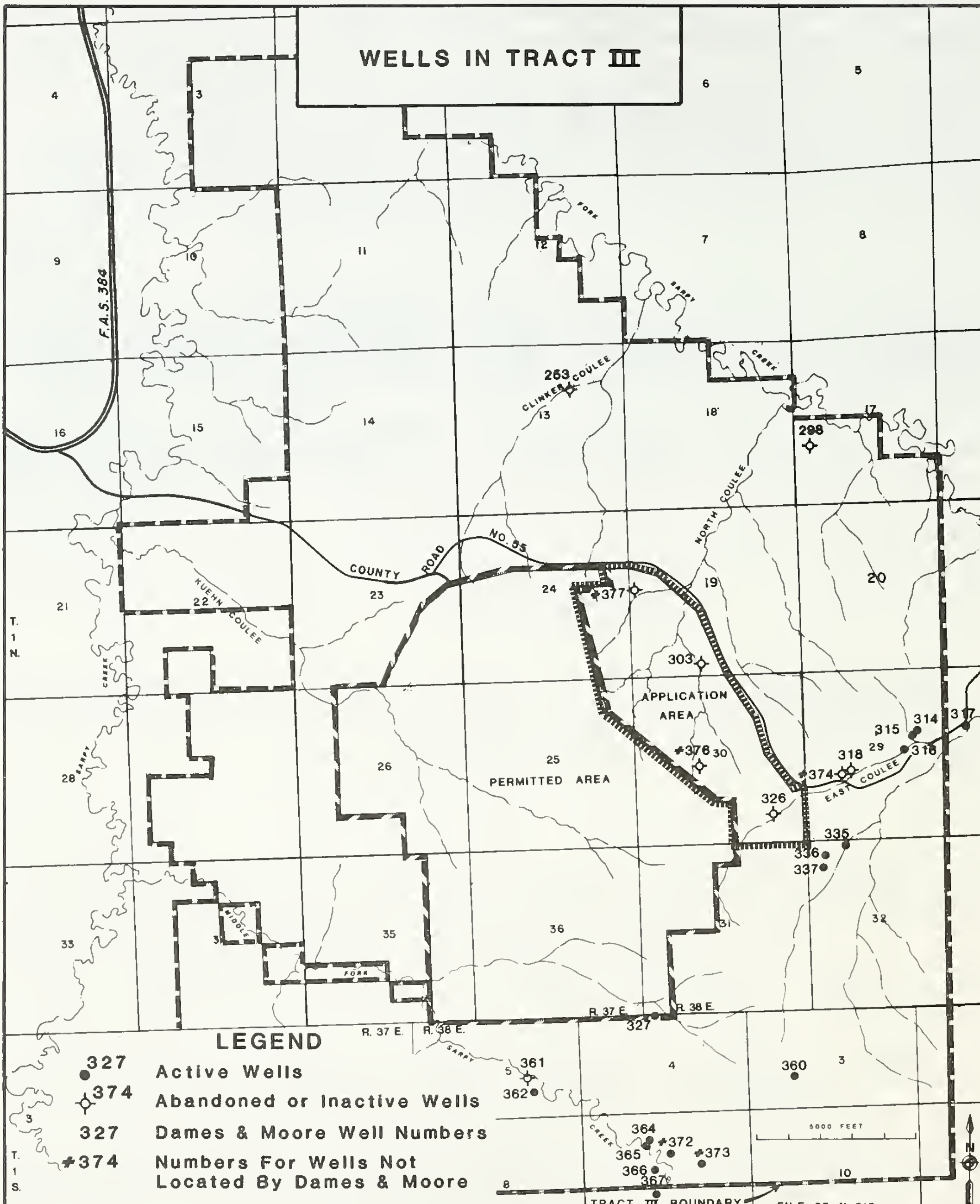


FIGURE II-3

Few wells have been drilled in Tract III, owing to the many springs available for high quality water.

TABLE II-4

Selected Data for Domestic and Stock Wells
In the Vicinity of Tract III

Well No.	Location	Aquifer of Completion	Present or Former Use	Status
253	01N37E13ACAB	Alluvium	Stock	Abandoned
298	01N38E17CBCA	Sub-Robinson	Household, Stock	Abandoned
303	01N38E19CDDC	Rosebud-McKay	Stock	Abandoned
306	01N38E27BBAB	Parting between Rosebud and McKay	Household, Stock	Abandoned
314	01N38E29ACDB	Rosebud-McKay Coal	Household	In use
315	01N38E29ACDB	Rosebud-McKay Coal	Household	In use
316	01N38E29ACCD	Alluvium	Stock	In use
317	01N38E28BDAD	Alluvium	Stock	In use
318	01N38E29CABC	Rosebud-McKay Coal	Stock	Abandoned
326	01N38E30DDBC	Overburden	Household	Abandoned
327	01N38E31CCCC	Rosebud-McKay Coal	Stock	In use
335	01N38E32BBAA	Alluvium	Stock	In use
336	01N38E32BBBD	Rosebud-McKay Coal and Underlying Interburden	Household	In use
337	01N38E32BBCA	Sub-Robinson	Stock	In use
360	01S38E03CDBC	Rosebud-McKay Coal	Stock	In use
361	01S38E05DCAB	Sub-Robinson	Household	Abandoned
362	01S38E05DCAD	Alluvium	Stock	In use
364	01S38E09BADB	Rosebud-McKay Coal	Household	In use
365	01S38E09BACD	Rosebud-McKay Coal	Household	In use
366	01S38E09BDAC	Rosebud-McKay Coal	Stock	In use
367	01S38E09BDDC	Rosebud-McKay Overburden	Stock	In use
372	01S38E09ABBC	Rosebud-McKay Coal	Stock	In use
373	01S38E09ACAD	Sub-Robinson	Household	In use
374	01N38E29CBAD	Rosebud-McKay Overburden	Household	Abandoned
375	01N38E22CCCC	McKay Coal	Household	In use
376	01N38E30CAAB	Overburden	Household	Abandoned
377	01N38E19BCCC	Rosebud-McKay	Stock	Abandoned

Source: Westmoreland Resources (1983).
Note: For well locations, see fig. II-3.

Depositional Soils

The depositional soils group covers about 14 percent of the disturbance area. The group consists of deep soils that are developing in alluvium (water-deposited material) and colluvium (material which has moved downhill and accumulated at the base of slopes as a result of gravity). Textures range from clay loam to sandy loam. Common vegetation found on the medium textured

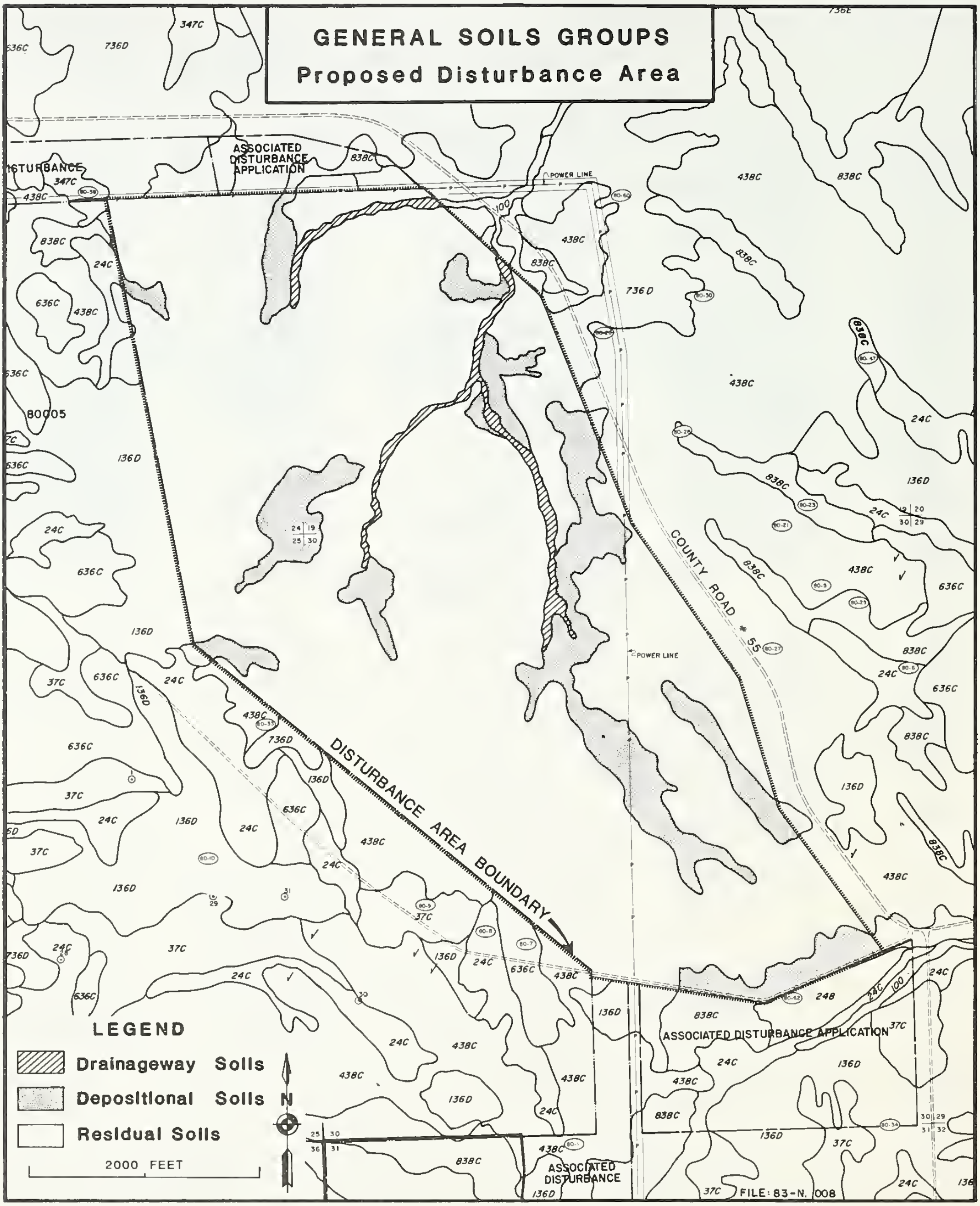


FIGURE II-4

Three major groups of soils lie in the 573 acres Westmoreland would disturb in the application area.

soil of this group includes blue grama, needle-and-thread, and western wheatgrass. Vegetation common to the coarser soils of this group includes little bluestem, green sagewort, prairie sandreed, and sideoats grama. Within this group, the Alice soils are forming mostly from sandy colluvium and some sandy alluvium, and the Fort Collins and McRae soils are forming in loamy and clayey alluvium.

Drainageway Soils

The drainageway soils group covers about 2 percent of the disturbance area. This group consists solely of the mapping unit called "Aquolls and Aquents." These soils are found only in drainageways with ground water seepage. The soils are stratified loam, sandy loam, silt loam, and clay loam. Weathered coal particles are common in some strata and are responsible for the black color at any depth in the soil profile. At some sites permanent water table fluctuates between the surface and a depth of 5 feet. The single mapping unit in this soil group is seldom greater than 100 feet wide. It includes the flat bottom of the drainageway and the short, steeply sloping banks that are not wet, but support wetland vegetation.

Prime Farmland Soils

Prime farmland consists of soils with favorable physical and chemical characteristics and an adequate moisture supply. (See ARM 26.4.301(49) and Federal Register 7 CFR 657.) Operators disturbing prime farmland must follow special handling and reclamation procedures.

In the application area, no developed water supply that is dependable and of adequate quality for irrigation exists. Therefore, none of the soils qualify for prime farmland designation.

VEGETATION

The proposed disturbance area is used primarily for livestock grazing (Montana Department of State Lands, 1979). Heavily grazed areas are dominated by increaser species. Included among the increasers are most shrubs and forbs and some grasses that increase in relative abundance under continued heavy grazing. Rangeland in good condition is indicated by an abundance of decreaser species. These are usually grasses which decrease in relative abundance under continued heavy grazing. Invader species (species not present in stable, mature vegetation communities) are common on disturbed lands.

The vegetation of the disturbance area (table II-5) can be classified into six types: grassland, ponderosa pine forest, riparian, deciduous tree and shrub, agricultural, and disturbance (Westmoreland Resources, 1983, bk. H, vol. 2). The grasslands can be subdivided based on range sites (U.S. Soil Conservation Service, 1971). Other types can be subdivided based on dominant vegetation or land use.

Pursuant to section 7 of the Federal Endangered Species Act, OSM consulted with the U.S. Fish and Wildlife Service for the listed species that could occur in the Area D vicinity. The list provided by the U.S. Fish and Wildlife Service did not contain any plant species. Therefore, mining in the application area would not affect any federal threatened and endangered plants.

Grassland makes up about 31 percent of the disturbance area (table II-5). The silty range subtype, more accessible to cattle than other sites, is dominated by increaser species. The sandy subtype, usually found on upper slopes, is in better condition. The shallow and thin breaks subtypes, generally found along ridges with minimal soil development, have highest range conditions. Overall, the range condition of the disturbance area is fair, based on U.S. Soil Conservation Service methods.

TABLE II-5

Vegetation Communities in Proposed Disturbance Area

Vegetation Type	Acres	Percent[1]	Associated Subtypes	Acres	Percent[1]
Grassland	176	31	Silty	89	16
			Sandy	80	14
			Shallow	2	--[2]
			Thin Breaks	5	1
Ponderosa Pine Forest	184	32	Open Canopy	122	21
			Closed Canopy	62	11
Riparian[3]	4	1	Wetland	4	1
Deciduous Tree and Shrub	24	4	Snowberry-Rose	20	3
			Shrub Thicket	4	1
Agricultural	154	27	Alfalfa Hay	88	15
			Small Grains	66	12
Disturbance	31	6	Disturbed Grassland	26	5
			Miscellaneous	5	1
TOTAL	573	100		573	100

Source: Westmoreland Resources, 1983, bk. H, ex. 7, p. 2.

[1] Percentages rounded to nearest whole number. Column 6 total rounded to 100 percent.

[2] less than 0.5 percent.

[3] Marsh and overflow subtypes were not included in vegetation mapping due to their limited acreages.

Increaser grasses common to all grassland range sites include western wheatgrass, penn sedge, needle-and-thread, and prairie junegrass. A decreaser grass found on all range sites is sideoats grama. Other common decreaser grasses are bluebunch wheatgrass, little bluestem, and prairie sandreed. (See app. G for scientific names.)

The primary invader species in grasslands is Japanese brome, which grows on sandy and silty range sites. Grassland forbs include western yarrow, Hood's phlox, and broom snakeweed. Shrubs growing in grasslands include yucca, skunkbush sumac, snowberry, and silver sage. These shrubs visually dominate some sites, such as drainages and swales. Scattered ponderosa pines are also found within grasslands.

Ponderosa pine grows primarily on northern exposures, where the soil contains more moisture. Forests of pine, covering 32 percent of the disturbance area, are divided into two subtypes: closed canopy (greater than 75 percent canopy coverage) and open canopy (25 to 75 percent canopy coverage). Mean densities of ponderosa pine are estimated at 1,320 trees per acre in the closed-canopy subtype and 117 trees per acre in the open canopy subtype. Both subtypes have a sparse understory because a covering of pine needles and limited sunlight penetration discourage other plant growth. Limited amounts of Idaho fescue, green needlegrass, and bluebunch wheatgrass, however, do provide cattle forage. Snowberry, skunkbush sumac, and various forbs also grow in the understory.

Riparian vegetation grows in coulee bottoms and around ponds (Table II-5). Slough sedge, a decreaser species, dominates the wetland subtype and accounts for their good range condition. Although not mapped because of their limited acreage, marsh and overflow subtypes also occur in the disturbance area. Marshes, consisting primarily of cattails and bulrush, are found near surface water. Brief flooding during spring encourages the growth of western wheatgrass, basin wildrye, and big bluestem in the overflow subtype.

The deciduous tree and shrub type covers only 4 percent of the disturbance area. (Although limited, the type functions as important wildlife habitat. See Wildlife.) The trees and shrubs usually grow along coulee bottoms. In the snowberry-rose subtype, snowberry normally makes up over 60 percent of the vegetative cover. Bluegrass is the most commonly associated grass. This subtype is often a riparian subtype that has deteriorated due to heavy grazing. In the shrub thicket subtype of the deciduous type, an overstory of hawthorn, plum, chokecherry, and buffaloberry grows with an understory of snowberry and rose. Green ash and box elder are occasionally intermixed.

Agricultural land covers about 27 percent of the disturbance area. Alfalfa grows in the southern end of the area. Grain fields, principally winter wheat and barley, occur in the north. (See Land Use for production figures.)

Disturbed grasslands, including seeded rangeland and old agricultural fields, make up most of the disturbance type (table II-5). In addition, the type contains gravel pits, buildings, and stock ponds.

Vegetation in the life-of-mine area is similar to vegetation within the disturbance area. As a proportion of the entire life-of-mine area, grassland makes up an estimated 56 percent; agricultural, 22 percent; ponderosa pine, 17 percent; and deciduous tree and shrub, 5 percent (Westmoreland Resources, 1983, bk. G, ex. G-15, pl. 1).

AQUATIC ECOLOGY

Aquatic populations within the mine plan area are limited in diversity and number. This reflects the small amount of aquatic habitat--small springs and ponds only. A qualitative benthic macroinvertebrate survey was conducted in 1981 (Westmoreland Resources, 1982, bk. G, vol. 3, ex. G-14). Most organisms collected were dipterans (true flies), hemipterans (true bugs), or coleopterans (beetles). (See app. B for a list of the invertebrates collected.) None of these organisms is threatened or endangered. No algae samples were collected. No fish were found.

An aquatic macroinvertebrate and fish survey was conducted in Sarpy Creek and East Fork Sarpy Creek during 1976 by the Cooperative Fishery Research Unit at Montana State University (Westmoreland Resources, Inc. 1980, bk. I, vol. 2, ex. I-17). Samples were collected at eight sites. Diptera was the most numerous group present; the families Tendipedidae and Simuliidae were usually dominant. (Organisms were identified only to the family level.)

The aquatic habitat of Sarpy Creek, particularly the upper reaches near the minesite, is primarily suited for nongame fish. Nineteen species of fish were identified. White sucker and lake chub were the most numerous.

WILDLIFE

The Tract III area's diverse topography and complex mosaic of vegetation types provides excellent wildlife habitat. (This section, Wildlife, is based on Westmoreland's annual wildlife surveys conducted since 1976 within Tract III [1983, bk. G, vols. 2 and 3].) Grassland is the most prevalent habitat type in Tract III and in the life-of-mine area (table II-6). The ponderosa pine type, making up about 42 percent of habitat coverage, is the most predominant type in the proposed disturbance area.

Nine rock outcrops within the life-of-mine area provide wildlife cover and nest sites. In the disturbance area, three ponds (one perennial, two seasonal), one seep (seasonal), and one spring with a stock tank (perennial) supply water and may serve as waterfowl habitat. Wildlife also use a perennial pond bordering the northeast corner of the disturbance area. (See Hydrology, Surface Water.) Six water sources for wildlife have been identified in the life-of-mine area.

Big Game

The big game species inhabiting Tract III are mule deer, white-tailed deer, and pronghorn antelope. (See app. C for scientific names of wildlife species.) Mule deer are the most abundant and widely distributed species. In 1981 distribution surveys, 26 were sighted in the proposed disturbance area and 63 in the life-of-mine area.

TABLE II-6

Wildlife Habitat Types
Tract III and Mining Areas

Habitat Type	Percent of Area[1]			Comments
	Tract III[2]	Disturbance[2]	Life-of-Mine[3]	
Grasslands	27	25	56	Native and disturbed
Ponderosa pine	22	42	17	All coverage classes
Agricultural	11	27	22	Grain and hay fields
Skunkbush sumac	11	0	--[4]	Skunkbush over grass
Silver sagebrush	10	3	--[4]	Silver sage over grass
Snowberry	5	2	2	Often in coulees
Big sagebrush	5	0	--[4]	Big sage over grass
Shrub thickets	3	1	3	In coulees and creeks
Mine area	6	0	0	Active mining areas
Reclaimed	2	0	0	Mined and reclaimed

Note: Criteria used in classification of wildlife habitat types differed from criteria used for vegetation communities.
[1]Rounded to nearest whole number.
[2]Percentages from Westmoreland, 1983, bk. G.
[3]Dot count method used to estimate percentages from Westmoreland's ex. G-15, pl. 1 (1983).
[4]Less than 1 percent.

Mule deer use a variety of habitat types to satisfy seasonal requirements (table II-7). The ponderosa pine type provides thermal cover in winter and shade in summer. It is also used for fawning. Agricultural lands, especially during fall, provide forage. The silver sagebrush type serves as transitional habitat between winter and summer habitats. Snowberry and shrub thicket types provide fawning and resting cover and succulent forage during dry months. Although these thickets make up only 8 percent of Tract III, they receive relatively heavy use. Reclaimed areas (lands planted in wheat, grasses, and legumes that are ungrazed by cattle) are used mostly in winter and spring for forage.

Data indicate that the mule deer in Tract III have high reproductive rates. In 1978 the fawn:doe ratio reached 118:100. Fawn:doe ratios have since declined, but the 1982 ratio of 90:100 is still considered high.

White-tailed deer are observed sporadically in all seasons. In 1981 distribution surveys, 3 deer were sighted in the application area and 26 in the life-of-mine area. Habitat use patterns resemble those of mule deer (table II-7). Whitetails, however, rely more heavily on the shrub thicket type for fawning, escape, and resting cover. Whitetails also forage more often in agricultural lands. The Tract III whitetail population has apparently declined since 1976. Whitetail observations over the past few years have been insufficient for calculation of fawn:doe ratios.

TABLE II-7

Big Game Habitat Use in Tract III
By Season, 1981

		Percent of Animals Observed in Type[1]			
Species	Habitat Type	Winter	Spring	Summer	Fall
Mule deer[2]	Grassland	16	23	11	5
	Ponderosa pine	34	16	31	18
	Agricultural	4	8	22	28
	Skunkbush sumac	4	4	8	5
	Silver sagebrush	7	22	8	25
	Snowberry	5	3	3	3
	Big sagebrush	2	1	0	1
	Shrub thicket	11	5	17	12
	Mine area	3	3	1	2
	Reclaimed	13	15	0	1
White-tailed deer[3]	Grassland	4	13	33	0
	Ponderosa pine	22	23	14	0
	Agricultural	57	8	5	100
	Snowberry	0	8	14	0
	Shrub thicket	17	38	33	0
	Others	-	13	0	-
Pronghorn antelope[4]	Grassland	-	62	100	-
	Ponderosa pine	-	16	0	-
	Shrub thicket	-	11	0	-
	Others	-	13	0	-

Source: Westmoreland Resources, 1983, ex. G-13.

[1] Rounded to nearest whole number.
[2] Number observed (including incidental sightings): winter, 460; spring, 513; summer, 195; fall, 547.
[3] Number observed (including incidental sightings): winter, 72; spring, 40; summer, 21; fall, 1.
[4] Number observed (including incidental sightings): spring, 90; summer, 44.

Good pronghorn habitat contains significant amounts of sagebrush (Severson and May, 1967; Amstrup 1978). The scarcity of sagebrush types in Tract III corresponds with the low number of pronghorn observations. Pronghorn were not observed in the fall and winter of 1981 on Tract III. Only seven were sighted during distribution surveys the rest of the year on the disturbance and life-of-mine areas. Most pronghorn have been observed in grasslands in the eastern and southeastern portions of Tract III (table II-7). Their use of wooded areas, probably for fawning, is uncharacteristic of the species (Einarsen, 1948; Rouse 1959). The low 1981 fawn:doe ratio of 31:100 reflects the poor quality of habitat.

Other Mammals

Coyotes have been frequently sighted in Tract III in grasslands and agricultural habitat types. Other predators observed include bobcats, badgers, long-tailed weasels, raccoons, and striped skunks. Porcupines, muskrats, white-tailed jackrabbits, desert cottontails, least chipmunks, and red squirrels also inhabit Tract III. The life-of-mine area includes a 3-acre black-tailed prairie dog town.

In 1981, Westmoreland placed small mammal traplines in ponderosa pine, grassland, agricultural, reclaimed, and coulee bottom habitat types. Ten traplines were within the proposed mining areas. Deer mice, trapped in all habitat types, constituted 79 percent of the total catch. Prairie voles, Wyoming pocket mice, meadow voles, and masked shrews were also trapped. Most captures were made in the dense cover of the coulee bottom and reclaimed types. The sparse understory of ponderosa pine forests accounted for only 2 percent of the catch.

Upland Game Birds

Flocks of 40 to 50 Merriam's wild turkeys have been commonly observed in Tract III. Turkeys have been sighted in both the disturbance and life-of-mine areas. Ponderosa pine is the most important turkey habitat type in most seasons. Turkeys roost in pines and feed on pine seeds. Open, grassy areas are used during spring courtship. Turkeys also feed in reclaimed and agricultural types. Dense coulee bottom vegetation supplies brood-rearing, feeding, and escape cover.

Seven sharp-tailed grouse dancing grounds, used by 66 courting males in 1982, lie within Tract III. The three grounds in the life-of-mine area were attended by 28 males the same year. Sharptails feed in grassland, agricultural, and reclaimed types near dancing grounds. Shrub thickets provide escape and resting cover.

Ring-necked pheasants inhabit lowlands near Sarpy Creek and its tributaries. The life-of-mine area contains about 2 miles of pheasant habitat along the East Coulee.

Waterfowl

Mallards, blue-winged teal, green-winged teal, and gadwalls nest within Tract III. Other waterfowl observed include shovelers, American widgeons, and Canada geese. Only mallards have been recorded in the proposed mining area.

Raptors (Birds of Prey)

Golden eagles, prairie falcons, great-horned owls, and screech owls reside year-round in Tract III. American kestrels, northern harriers, and red-tailed hawks have been commonly observed in summer. One great-horned owl pair nests in the disturbance area and another nests in the life-of-mine area. A red-tailed hawk pair nests in the life-of-mine area, less than 0.25 miles east of the disturbance area. Another red-tailed hawk nest and a northern harrier nest lie between the southern and eastern portions of the life-of-mine area.

Songbirds

Songbird surveys were conducted in 1981 in the proposed mining areas. Coulee bottom, ponderosa pine, grassland, and disturbed grassland types were sampled. Coulee bottoms had the most diverse populations with 33 species counted in the East Coulee. Common coulee bottom species included robins, yellow warblers, and rufous-sided towhees. Only western meadowlarks and vesper sparrows were observed in grasslands, while no observations of any songbirds were made in disturbed grasslands. Red crossbills were the most abundant ponderosa pine species.

Reptiles and Amphibians

Prairie rattlesnakes, gopher snakes, yellow-bellied racers, western painted turtles, spadefoot toads, and western toads were recorded in 1982 in Tract III.

Threatened and Endangered Species

Pursuant to section 7 of the Federal Endangered Species Act, OSM consulted with the U.S. Fish and Wildlife Service for the listed species that could inhabit the Absaloka Mine area. The U.S. Fish and Wildlife Service responded with a list containing the peregrine falcon, the bald eagle, and the black-footed ferret. Black-footed ferrets are usually associated with prairie dog towns. Although the town in the life-of-mine area has not been thoroughly searched, this endangered species has not been observed (M. Mitchell, Westmoreland Resources, pers. commun., 1983). Migrating bald eagles and peregrine falcons have been occasionally observed over Tract III. No nests or concentration areas have been found.

CLIMATE

The Sarpy Creek area has a climate typical of the semiarid northern Great Plains. Precipitation is low but variable and falls primarily during late spring and early summer. Daily and seasonal temperatures range widely. Surface humidity is low. Wind speeds are moderate.

Precipitation

Total annual precipitation in the area averages between 14 and 15 inches (Toy and Munson, 1978). At the mine itself, during 1976 to 1981, the annual average precipitation was 14.0 inches and ranged from 12.6 to 24.2 inches (Westmoreland Resources, 1983, bk. F, vol. 1-3). About 43 percent of the total precipitation fell from April through June. Annually, precipitation is expected to fall on 95 days. Snowfall amounts total 30 to 50 inches per year (U.S. Department of Interior and Montana Department of State Lands, 1980, p. II-22). Recurrence intervals for 1-, 6-, and 24-hour precipitation events (rainstorms, snowfalls) are presented in table II-8.

TABLE II-8

Maximum Precipitation Expected
At the Absaloka Mine During Various Time Intervals

Length of Event (hours)	Number of years considered: 2	5	10	25	50	100
	Amount of Precipitation (Inches)					
1	0.7	0.9	1.1	1.3	1.5	1.7
6	1.0	1.3	1.6	2.0	2.2	2.4
24	1.4	2.0	2.4	3.0	3.4	3.8

Evaporation

Evaporation was measured with a Class A evaporation station at the mine office. The mean annual evaporation for the period May through September was about 33.4 inches from 1976-1981 (Westmoreland Resources, 1983, bk. F, vol. 1-13).

Humidity

During 1981, relative humidity averaged about 50 percent, being highest during the cooler months and lowest during the warmer months.

Temperature

Average temperatures range from 45 to 50° F. July and August are the hottest months and January and February are the coldest months. The potential growing season, based on the freeze-free period of 100 to 105 days, is effectively terminated during mid-summer when drought-induced dormancy of vegetation occurs (Toy and Munson, 1978).

Winds

Wind speeds average 6 to 7 miles per hour. Calm periods are rare, occurring less than 1 percent of the time (Westmoreland Resources, 1983, bk. F, vol. 1-3). There is a near even distribution of winds, blowing from all directions.

The regional EIS on the Northern Powder River Basin (U.S. Department of the Interior and Montana Department of State Lands, 1978) and the previous EISs on the Absaloka Mine (Montana Department of State Lands, 1979; Montana Department of State Lands, 1977; U.S. Department of the Interior, 1977) contain further information on the climate at Sarpy Creek.

AIR QUALITY

The quality of the air near the Westmoreland Mine is very good. Total suspended particulate (TSP) concentrations are well below federal and Montana standards. All monitoring sites, except one at the train-loading facility, measured TSP concentrations similar to those found at undisturbed areas in southeastern Montana.

Westmoreland operates an air quality monitoring network around the mine (table II-9). The federal and Montana ambient air quality standards for TSP (table II-10) have never been exceeded (figs. II-5 and II-6). The highest TSP concentrations would be expected to occur at site 2, located nearest the coal handling facilities. This is in fact the case. Still, even here, annual TSP concentrations average 50 $\mu g/m^3$ (micrograms per cubic meter) or less.

TABLE II-9

Location of Air Samplers

Site	Approximate Distance From Mine (Miles)*	Direction from Mine
2	--	--
4[1]	2.8	SE
5	2	SE
6	1.5	E
7	2.5	NW
10[1]	2	NE

*Distance from train-loading station

[1]discontinued in December 1982.

Rarely, probably during high winds, 24-hour TSP concentrations at site 2 have reached extremely high levels--over 700 $\mu g/m^3$. These levels exceed by far the federal and Montana 24-hour standard. But since site 2 is on the permit area, where the public does not have ready access, the ambient air quality standards do not apply. Moreover, even outside the permit, the 24-hour maximum TSP standard can be exceeded once per year (table II-10).

Farther from mining, annual average TSP concentrations closely match those found in other rural areas of Montana (Raisch et al., 1982). Very high 24-hour TSP concentrations have occurred only once at these monitoring sites during the past 5 years, again probably during high winds.

Dustfall (settled particulate), composed of large particles, is also monitored around the mine. The Montana standard (10gm/m^2 = 30-day average) was exceeded in 1981, but since the large dustfall particles settle to the ground very close to the source, they have little effect outside the mine. Dustfall monitoring was discontinued in August 1982 with the approval of the Air Quality Bureau.

TABLE II-10

Montana and National Air Quality Standards

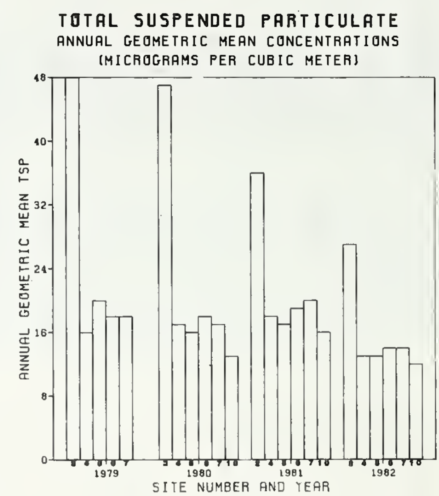
Pollutant	Montana Standard	Federal Primary Standard	Federal Secondary Standard
Total Suspended Particulates	75 $\mu g/m^3$ annual arithmetic average	75 $\mu g/m^3$ annual geometric mean	60 $\mu g/m^3$ annual geometric mean
	200 $\mu g/m^3$ 24-hr average*	260 $\mu g/m^3$ 24-hr average*	150 $\mu g/m^3$ 24-hr average*
Sulfur Dioxide	0.02 ppm annual average	0.03 ppm annual average	0.5 ppm 3-hr average*
	0.10 ppm 24-hr average*	0.14 ppm 24-hr average*	
	0.50 ppm 1-hr average**		
Carbon Monoxide	9 ppm 8-hr average*	9 ppm 8-hr average*	9 ppm 8-hr average*
	23 ppm hourly average*	35 ppm 1-hr average*	
Nitrogen Dioxide	0.05 ppm annual average	0.05 ppm annual average	0.05 ppm annual average
	0.30 ppm 1-hr average*		
Photochemical Oxidants (ozone)	0.10 hourly average*	0.12 ppm 1-hr average*	0.12 ppm 1-hr average*
Lead	1.5 $\mu g/m^3$ 90-day average	1.5 $\mu g/m^3$ calendar quarter average	None
Foliar Fluoride	35 $\mu g/g$ grazing season	None	None
	50 $\mu g/g$ monthly average	None	None
Hydrogen Sulfide	0.05 ppm hourly average*	None	None
Settled Particulate (Dustfall)	10 gm/m^2 30-day average	None	NOne
Visibility	Particle scattering coefficient of 3×10^5 per meter annual average***	None	None

Note: $\mu g/m^3$=micrograms pollutant per cubic meter of sampled air; ppm=parts pollutant per million parts of sampled air

*Not to be exceeded more than once per year

**Not to be exceeded more than 18 times per year

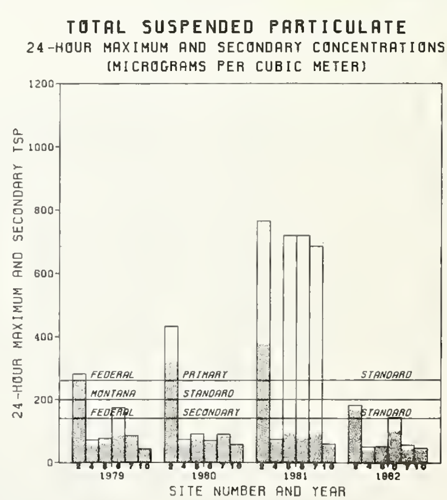
***Applies to PSD Class I areas



SOURCE: WESTMORELAND RESOURCES, 1983, BOOK F

FIGURE II-5

Data show the air in the Absaloka Mine area to be of high quality. Annual geometric mean total suspended particulate concentrations have never exceeded federal standards. In micrograms per cubic meter, the federal primary standard is 75, the secondary standard, 60.



NOTE: SHADING SHOWS SECOND HIGHEST TSP RECORDED

SOURCE: WESTMORELAND RESOURCES, 1983, BOOK F

FIGURE II-6

Maximum 24-hour total suspended particulate concentrations have exceeded the levels specified in ambient air quality standards. However, the standards themselves have not been violated. Concentrations may exceed the standards' levels once per year without violation. In micrograms TSP per cubic meter, the federal primary standard is 260, the Montana standard 200, and the federal secondary 150.

Gaseous emissions at the mine, primarily from mine equipment, are not considered serious enough to require monitoring (Montana Department of State Lands, 1977, p. II-18).

ECONOMICS

Big Horn County

Industrial and Commercial Activity

Big Horn County grew and prospered during the last half of the nineteenth and first half of the twentieth century. Development focused on the basic agricultural economy that remains today.

Livestock production, both sheep and cattle, now dominates county agriculture. The Holly Sugar Company factory in Hardin, open until 1970, encouraged today's production of sugar beets (Historical Research Associates, Inc. [HRA], p. 107). Some grain, chiefly wheat and barley, is also grown in the county.

The two Indian reservations in Big Horn County, particularly the Crow Reservation, have helped shape the development of the county's economy (Mountain West Research-North, Inc., [MWR-N], 1983, p. 3-18; HRA, 1983, p. 108). Because of the reservations, federal government money has flowed to area businesses via employment, per capita payments of coal lease revenues, and transfer payments to tribal members. Meanwhile, area ranchers have supported livestock operations by leasing grazing land on the Crow Reservation (MWR-N, 1983, pp. 3-18 and 3-19). In some respects, federal administration of much of the county's land may have encouraged the establishment of large corporate agricultural operations, such as the Campbell Farming Corporation and the sheep operation of Charles Bair (HRA, 1983, p. 108).

The opening of the Decker coal mine in 1972 and the Absaloka Mine in 1974 were the major industrial developments in the 1970s. The mine openings were the beginning of a new phase in the development of the county's economy.

Hardin is the principal trade center in the county. It is, however, a second-order center. That is, it provides some specialized goods and services, but has a limited market area. Consumers from the northern part of the county tend to bypass Hardin to shop in Billings. Southern Big Horn County residents tend to make their major purchases in Sheridan, Wyoming (MWR-N, 1983, p. 2-64).

Quantity and Distribution of Employment

A computer model was used to generate much of the economic data for the EIS. (See Introduction.) The technique used by the model to project employment growth is called "economic (or export) base." The economic base approach assumes that an area's jobs can be divided into two sectors, basic and nonbasic. Basic jobs arise from work shaped by forces outside the area. This

includes tourist-related business, government work, and business associated with selling an area's goods and services to the outside ("exporting"). Nonbasic jobs arise from work associated with goods and services sold inside an area. Nonbasic has many other names: induced, derivative, secondary, residentiary, and ancillary. The number of nonbasic jobs is believed to be determined by the number of basic jobs.

As in the rest of the U.S. between 1960 and 1980, the number of rural agricultural jobs in Big Horn County declined. Offsetting the decline was job growth in mining, construction, and services. Between 1970 and 1980, total employment increased by about 18 percent (fig. II-7), from 3,796 to 4,483 jobs (table II-11). Despite the decline, agriculture remained the largest basic employment sector in 1980, and it is likely to stay the largest in the future, because almost all Decker-area miners live in Wyoming.

Basic industry jobs in Big Horn County in 1980 stemmed from agriculture (41 percent), services (25 percent), government (18 percent), mining (11 percent) and other industries (5 percent) (MWR-N, 1983, p. 3-72). The high proportion of service and government employment demonstrates the importance of the Crow Indian Reservation to the county's economy.

Nonbasic employment in 1980 was dominated by jobs in the trade and services industries, which made up 51 percent of the sector. Other major employers were government (22 percent), construction (7 percent), finance,

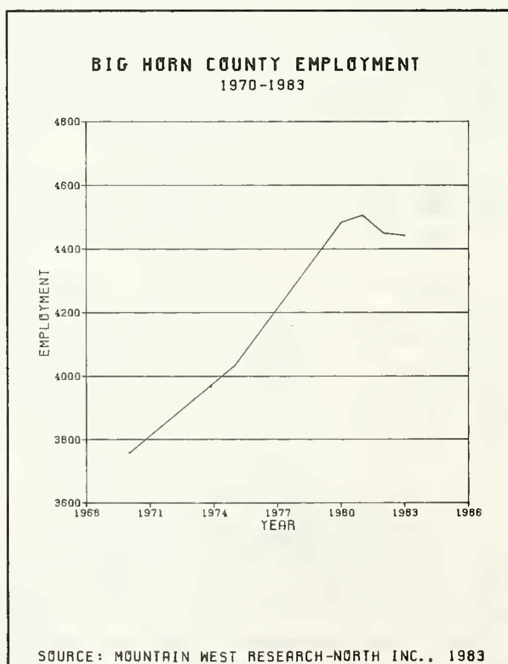


FIGURE II-7

Growth in employment in Big Horn county during the 1970s was caused by a rise in mining, construction, and utilities jobs. The decline in the early 1980s stemmed from layoffs at the Absaloka Mine and cuts in federal spending on the reservations. (Note that the scale of the graph is exaggerated for emphasis.)

insurance, and real estate (5 percent), and transportation, communications, and utilities (5 percent) (MWR-N, 1983, p. 3-72).

Employment at the Absaloka Mine has gone up and down with changes in the amount of coal produced and construction of equipment and facilities (table

TABLE II-11

Employment of Big Horn County Residents By Sector, 1980

Industrial Sector	Total Employment Amount	Total Employment Percent	Basic Employment Amount	Basic Employment Percent	Nonbasic Employment Amount	Nonbasic Employment Percent
Agriculture	1,004	22.4	929	40.7	75	3.4
Mining	239	5.3	239	10.5	0	0
Construction	225	5.0	70	3.1	155	7.0
Manufacturing	49	1.1	0	0	49	2.2
Transportation, communications, and utilities	125	2.8	16	0.7	109	4.9
Trade	665	14.8	36	1.6	629	28.6
Finance, insurance, and real estate	131	2.9	13	0.6	118	5.4
Services	1,049	23.4	559	24.5	490	22.2
Government	996	22.2	418	18.3	578	26.2
Total	4,483	99.9	2,280	100.0	2,203	99.9

Source: MWR-N, 1983, p. 3-72

TABLE II-12

Production and Employment at the Absaloka Mine, 1974-1983

Year	Production (million tons)	Employment Operations	Employment Construction	Employment Total
1974	1,457,673	110	176	276
1975	4,048,082	110	0	110
1976	4,083,894	110	0	110
1977	4,529,053	150	0	150
1978	4,554,201	150	0	150
1979	4,948,346	197	59	256
1980	4,905,882	185	0	186
1981	4,450,593	164	0	164
1982	4,159,219	132	0	132
1983	3,500,000	125	0	125

Sources: Westmoreland Resources, Inc., written commun., June 1, 1979, November 19, 1982; Montana Department of Revenue, various dates, unpublished quarterly report.

II-12). Layoffs at the Absaloka Mine in the early 1980s, together with the national recession and federal Indian program funding cutbacks, contributed to the decline in total employment in Big Horn County between 1980 and 1982 (fig. II-7).

Community and Personal Income

Energy-related employment growth in Big Horn County between 1970 and 1980 markedly increased total and per capita personal income (MWR-N, 1983, p. 3-67). Total personal income (in constant dollars) increased by 60 percent, per capita income, by 45 percent (MWR-N, 1983, p. 3-74). Labor and proprietor's income, the fastest-growing contributor to the county's total personal income, more than doubled (MWR-N, 1983, p. 3-74), reflecting the relatively high salaries of mine workers. Much of the increase in the county was earned by residents of Sheridan County, Wyoming. This income went immediately to Wyoming, leaving Montana, so total personal and per capita income went up by a smaller percentage (MWR-N, 1983, p. 3-74).

The royalty payments paid to the Crow Tribe by Westmoreland Resources Inc. are nearly as important a source of personal income in the county as the jobs at the mine. Sixty percent of the total royalty payment (table II-13) is paid out to tribal members as dividend or per capita payments. In 1982, for example, the total mine payroll was about $4.4 million, while the royalty payment to the tribe was about $2.7 million. The part of the royalty not paid out as dividends has also boosted local incomes, since it was spent locally--to repurchase land once owned by the tribe or to finance other programs.

TABLE II-13

Royalties Paid to the Crow Tribe, 1974-1982

Year	Amount	Year	Amount
1974	$ 394,285	1979	$2,321,189
1975	1,495,143	1980	1,662,953
1976	1,614,139	1981	2,128,096
1978	1,790,805	1982	2,701,697

Source: Westmoreland Resources, written commun., June 1, 1979 and November 19, 1982

SOCIAL CONDITIONS

Big Horn County

Big Horn County, Montana, has developed, economically, socially, and politically, in a way similar to the surrounding area. The county was first inhabited by native people, principally the Crow and later the Northern Cheyenne Indians. Whites then explored and settled in the county, drawn first by an active fur trade and afterwards by an open-range cattle industry. From 1850 to 1950, the county grew and prospered (Historical Research Associates [HRA], 1983).

Big Horn County development has focused on one industry--agriculture--which has permeated political and social institutions. Sheep and cattle production have dominated, accompanied until 1970 by sugar beet production for the Holly Sugar Company factory in Hardin. Hardin, serving as a local trade center, has broadened the economic base, but many area residents have traded in Billings or Sheridan instead.

Big Horn County's land use history is unique. Unlike surrounding counties, the two Indian reservations have given control of almost two-thirds of the land in Big Horn County to the federal government. Moreover, the county was not organized until 1913, and therefore lacked coordination of land use until after that time (HRA, 1983).

Social Organization

Big Horn County today retains much of its agriculturally oriented economic, political, and social structure. Little industrial growth occurred in the first half of the twentieth century, when a strong agricultural identity developed. The county has only recently begun to experience a changing political and social environment from industrial expansion, principally coal development.

The expansion of the energy industry has given Big Horn County experience in dealing with energy-related growth. The experience has prepared residents, businesses, and governmental organizations to deal more effectively and pragmatically with future growth. The area's communities have established alliances and contacts with state and federal agencies and with other local governments that can provide information, money, and expertise. The experience with energy development has reduced the area's isolation and, in turn, integrated local concerns into regional, state, and national affairs. To some in the area, this has been viewed as advantageous, to others, as an intrusion of the outside world into local and personal relationships.

As the economy and population of the area have changed, the opportunities for political, economic, and social power (influence and status) have begun to adjust. As newcomers with professions or allegiance to outside organizations have become more numerous and important, and as the proportion of the population in the working ages has increased, the dominance of the elderly and of ranchers with "pioneer" heritage has been reduced. (For more information about social organization in Big Horn County, see MWR-N, 1983).

Big Horn County (Excluding the Reservations)

Population

Big Horn County is divided into three nonreservation subcounty areas: Big Horn County North, Hardin City, and Decker. Big Horn County North includes all of the county north of the reservations, except Hardin City. The Decker area includes all of southeastern Big Horn County outside the reservations.

Overall, the county's population increased 10.3 percent from 1970 to 1980, 3 percent slower than the state's population over the decade (fig. II-8 and app. D, table D-1). The three nonreservation units within the county underwent sharply different population changes. The northern part of the county increased by a rapid 762.7 percent, the Decker area decreased by 22.9 percent, and the city of Hardin increased by 20.7 percent.

The median age increased in Big Horn County by over two years between 1970 and 1980 (table II-14). Even so, in both 1970 and 1980, the median age was more than three years less in Big Horn County than in Montana as a whole.

The percentage of nonwhites (mostly Crow and Northern Cheyenne Indian) in the population is much higher in Big Horn County than in the state as a whole (fig. II-9 and table II-14). Census figures show that the percentage of nonwhites increased from 40.2 in 1970 to 47.9 in 1980. (The Crow Reservation analysis assumed that the 1980 census undercounted Crow Indians living in Big Horn County by about 21 percent. If this is correct, Crow and Cheyenne Indians actually constitute over 50 percent of the county population, and the county's median age is probably lower.)

Housing

Between 1970 and 1980, the total number of housing units in Big Horn County grew 33.3 percent, while year-round units grew 29.8 percent (fig. II-10

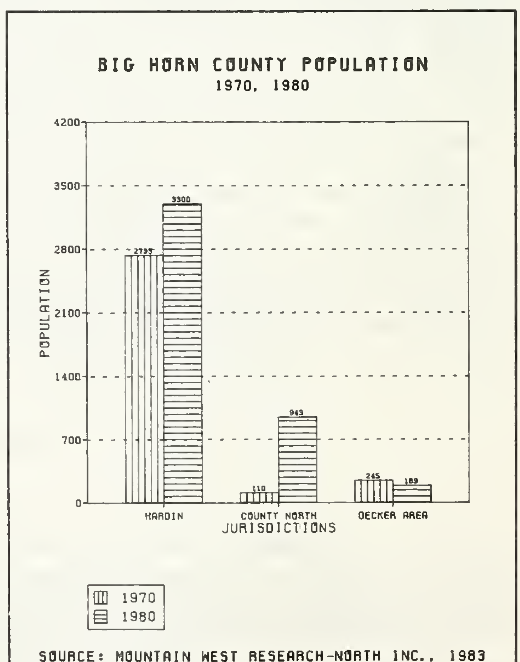


FIGURE II-8

Big Horn County's population as a whole grew only 10.3 percent during the 1970s. Parts of the county, however, such as the northern part, grew exceptionally fast.

TABLE II-14

Distribution of Population by Age and Race
Big Horn County and Montana
1970, 1980

Population Characteristics	1970 Big Horn County Number	1970 Big Horn County Percent	1970 Montana Percent	1980 Big Horn County Number	1980 Big Horn County Percent	1980 Montana Percent
Age Distribution						
Under 5	1,104	11.0	8.3	1,184	10.7	8.2
5-9	1,273	12.7	10.6	1,066	9.6	7.7
10-14	1,193	11.9	11.2	1,044	9.4	7.9
15-19	985	9.8	10.2	1,164	10.5	9.5
20-24	697	6.9	7.3	954	8.6	9.4
25-29	656	6.5	6.1	968	8.7	9.1
30-34	577	5.7	5.5	860	7.7	7.8
35-39	514	5.1	5.2	664	6.0	6.1
40-44	506	5.0	5.5	535	4.8	5.1
45-49	509	5.1	5.5	479	4.3	4.6
50-54	512	5.1	5.6	440	4.0	4.7
55-59	476	4.7	5.0	439	4.0	4.6
60-64	362	3.6	4.1	398	3.6	4.4
65+	693	6.9	9.9	901	8.1	10.7
Median Age	23.4		27.1	25.7		29.0
Ethnic Distribution						
White	6,018	59.8	95.7	5,781	52.1	94.1
Nonwhite	4,039	40.2	4.3	5,315	47.9	5.9
TOTAL POPULATION	10,057			11,096		

Source: U.S. Department of Commerce, Bureau of the Census, 1970 Census of the Population: Characteristics of the Population, Montana, Tables 19, 20, 34, 35, 49, 50; U.S. Department of Commerce, Bureau of the Census, 1980 Census of the Population: Characteristics of the Population, Montana, Tables 19, 20, 46.

Note: These figures do not reflect the undercount of Crow Indians in the 1980 U.S. Census.

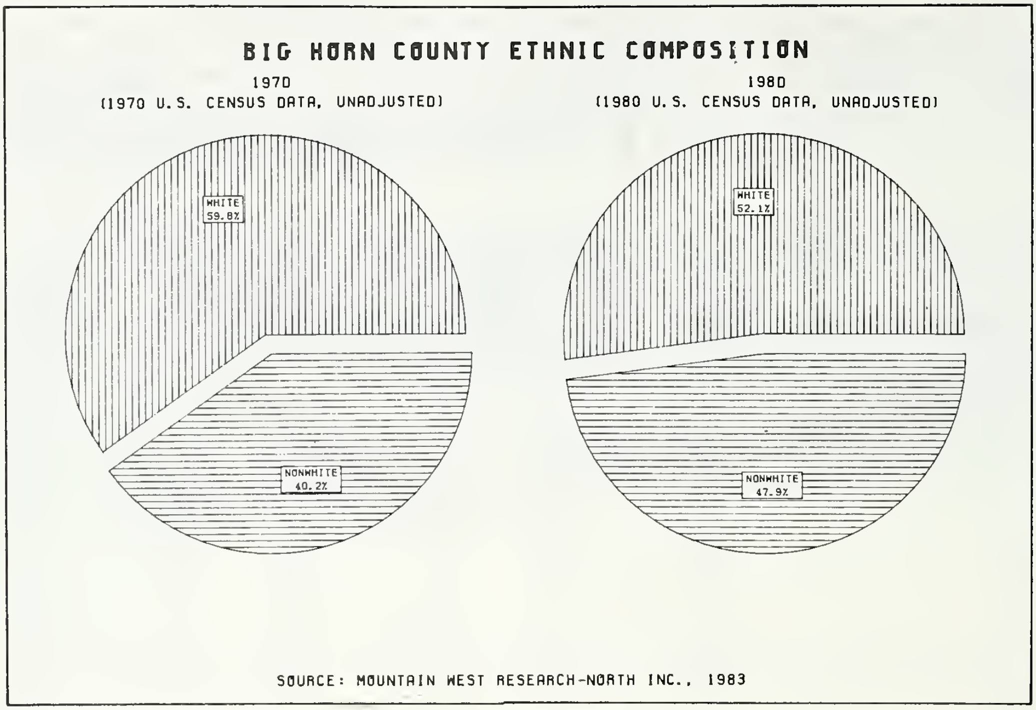


FIGURE II-9 (above)

Whites dominated the population of Big Horn county in 1970 (left). Rapid population growth of the nonwhite (Indian) population has since brought the ratio of whites to nonwhites to nearly 50:50 (right).

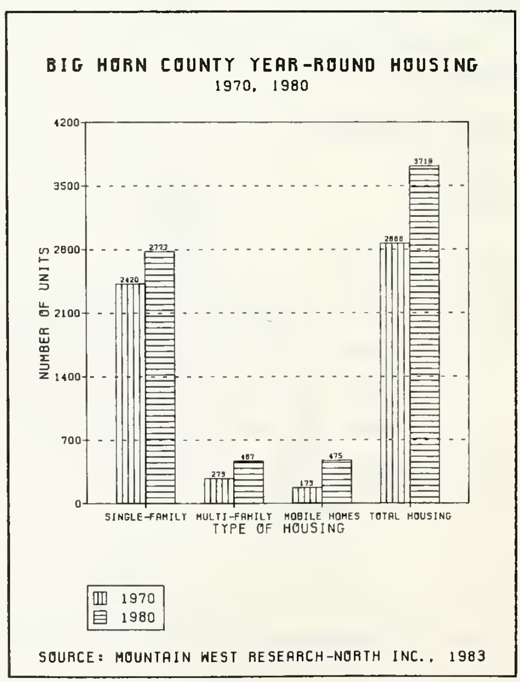


FIGURE II-10 (right)

The total number of housing units in Big Horn County grew by a third during the 1970s. The largest increase in the number of units was in single-family housing. The highest percentage increase was in mobile homes.

app. D, table D-2). Of the year-round units, mobile homes grew fastest, 174.6 percent. In contrast, multifamily homes grew by 71.1 percent, and single family detached units grew by only 14.8 percent.

Crow Reservation

Population

The 1980 census counted 5,645 people on the reservation. Because information from the Crow Tribe indicates that the census may have undercounted Crow Indians by as much as 21 percent (app. D, table D-3), the actual population may be much higher (fig. II-11).

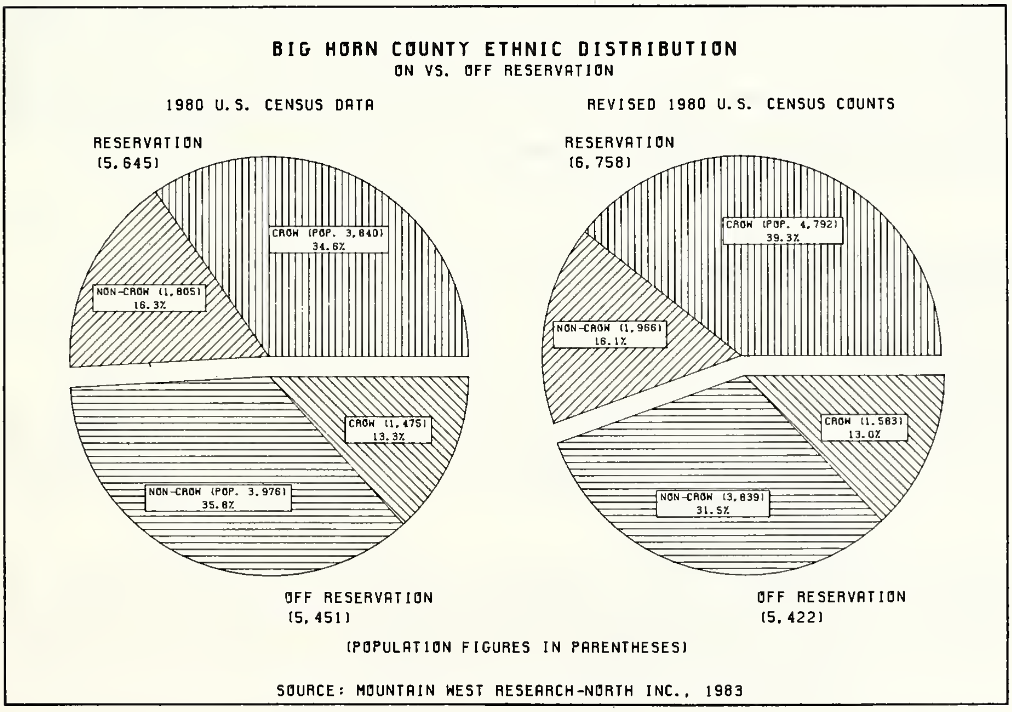


FIGURE II-11

U.S. Census figures (left) may not accurately reflect the size of the Crow Indian population in Big Horn County. Adjusted for a possible undercount (right), the 1980 census figures show a much greater proportion of Indians.

Housing

Housing for Crow Indians on the reservation is insufficient to meet current demand (MWR-N, 1983, 1983, p. 4-121). This is partly because of the U.S. Department of Housing and Urban Development (HUD) moratorium placed on house financing in the late 1970s and early 1980s. The moratorium has recently been lifted, and 115 new units are scheduled for construction.

Northern Cheyenne Reservation

Population

In 1980, the population on the Northern Cheyenne Indian Reservation was 3,255, about 822 (25 percent) of which was in Big Horn County. The Northern Cheyenne population has a younger median age than the surrounding non-Indian population: about 50 percent of the Indians are sixteen years of age or younger. (For more detailed population characteristics, see Northern Cheyenne Tribe Planning Office, 1981.)

Housing

In 1980 there were 288 housing units on the Big Horn County portion of the Northern Cheyenne Reservation. Of the total, 217 were Indian and 71 were non-Indian units (MWR-N, 1983, p. 3-205).

SOCIAL AND COMMUNITY SERVICES

Big Horn County

The county provides the following services:

- general government
- engineering and planning
- law enforcement
- fire protection
- hospital care
- library
- human and health services
- parks and recreation
- solid waste disposal
- education

Most of these services are administered from Hardin, but equipment and personnel are stationed in various locations. Some of these and additional services (i.e., water and sewage) are also provided by the city of Hardin. A detailed description of each service is contained in a 1983 report by Mountain West Research-North, Inc. (MWR-N, 1983).

General government staffs and facilities are now adequate for both Hardin City government and Big Horn County government. The county has enough engineering and planning space, staff, vehicles, and equipment, but not enough county shop space, for current needs. A new shop is planned that will be adequate for today's needs. Hardin's engineering and public works department now has sufficient personnel and space.

The sheriff's department provides law enforcement for the county and city of Hardin. The number of staff (18 to 20) and vehicles (9) has not changed for the past few years and appears adequate. A recent addition to the courthouse makes the facility adequate for current needs.

The Big Horn County fire department, staffed entirely by volunteers, serves the unincorporated parts of the county. Buildings and equipment are adequate for current needs. Hardin's fire protection is provided by a 20-member volunteer department. Present needs do not require a paid staff or additional equipment.

The Big Horn County Hospital is a self-supporting nonprofit government agency. Fees and charges cover operating and maintenance costs. Capital equipment is purchased by the county. The hospital has 16 acute and 34 long-term care beds. The acute care beds now average 56 percent occupancy and long-term beds nearly 100 percent occupancy. By either local or national standards, bed space is adequate.

The hospital also provides nursing-home beds. The 1983 expansion program, the new 36-bed nursing home, and 20-unit retirement home should provide adequate hospital services for current needs.

The Big Horn County library in Hardin serves the entire county. Facilities are considered adequate, although the librarian feels expansion could be necessary if the population increases significantly (MWR-N, 1983, p. 3-87).

Ambulance and public health services are provided for the entire county from Hardin. The privately owned ambulance service has sufficient personnel and equipment to adequately serve current needs. The number of public health personnel has remained constant in recent years. The large variety of services offered is difficult to evaluate, but the services appear to be adequate.

Big Horn County oversees the county fair board and the county park board. The fairgrounds have recently been expanded for social events. The county park board has coordinated construction at the fairgrounds of softball fields, which were built using county funds and volunteer labor. The resulting increase in recreation facilities adequately serves the current population.

Hardin now contains 5 acres of developed and 2.25 acres of undeveloped park land. Two to three additional acres may be needed soon; the town already owns the additional acreage.

Big Horn County takes part in a tricounty solid waste system established in 1978. Collection is adequately supplied by private contractors. The landfill site, owned by Hardin but operated by the county, covers about 40 acres and is adequate for current needs.

Hardin is responsible for garbage collection in town, using two trucks, each with a crew of three. No new trucks or equipment are necessary to meet current demands.

Hardin's water system has been gradually renovated over the past 20 years. The treatment facility has a capacity of 2½ million gallons per day and is adequate for a population of 11,000. Water storage capacity is sufficient for a population of 6,500. Both treatment and storage capacity are adequate.

Hardin's sewer system is new and consists of oxidation ditches. Local sources indicate that the system's 1-million-gallon capacity is adequate for a population of 6,000.

Education

Public education in Big Horn County is provided by three high schools and ten elementary schools. The county is divided into seven elementary school districts and three high school districts (fig. II-12). During the 1982-1983

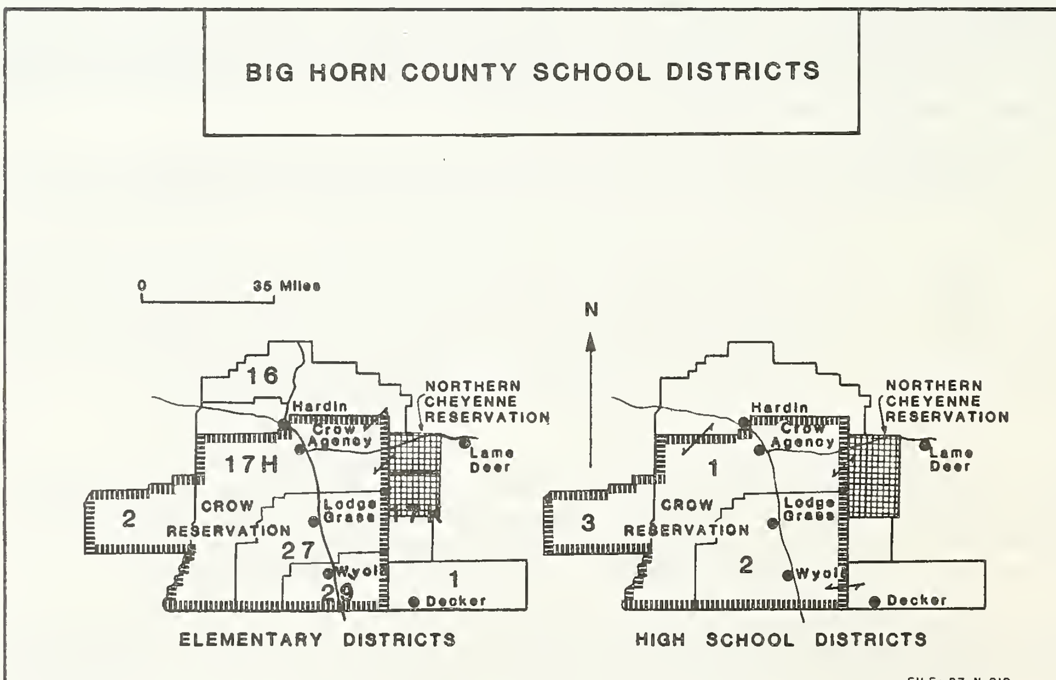


FIGURE II-12

Big Horn County has seven elementary and three high school districts. Elementary district 17H and high school district 1 are the most affected by the Absaloka Mine.

school year, the county's public schools enrolled approximately 670 high school students and 1,600 elementary school students.

All thirteen public schools have enough teachers to serve current enrollments. Eleven schools have surplus capacity, one (Lodge Grass High School) has adequate capacity, and one (Lodge Grass Elementary School) has inadequate capacity.

Two private schools, St. Charles Mission School in Pryor and Pretty Eagle School in St. Xavier, also serve Big Horn County. Little Big Horn College is located in the county as well. The two private schools employ 17 teachers and the college has 2 full-time and 16 part-time instructors.

Crow Reservation

In many cases, the financing, administration, and operation of public facilities and services on the Crow Indian Reservation involve many government units. The Crow Indian Tribal Government (CITG), Bureau of Indian Affairs (BIA), Indian Health Service (IHS), other federal and state agencies, and local public and private organizations provide services to reservation residents. The public facilities and services (described in MWR-N, 1983) in operation on the Crow Indian Reservation include the following:

- general government
- police
- fire protection
- hospital and health services
- social services
- mental health services
- community health services
- recreation facilities

General government staff and facilities for Crow Indian tribal government are now adequate. The police staff of 15 sworn officers is considered barely adequate. The seven patrol vehicles are adequate for the number of officers. The public safety building, providing office, dispatch, and detention facilities, has surplus capacity.

The six part-time Bureau of Indian Affairs Forestry Department fire personnel are not adequate to serve the reservation's range and forest fire needs. Additional fire space and equipment are also needed. Structural fire protection is provided by the county.

The number of physicians serving the reservation, now totaling five, is not sufficient. The number of dentists (three) is adequate. The number of existing hospital beds (34) is also adequate. Ambulance service for emergencies is contracted through a private Hardin service covering the entire county. The distance from Hardin to some points on the reservation can cause emergency service to be inadequate.

The reservation is served by one medical social worker, one mental health specialist, and four community health nurses. More medical social workers, mental health workers, and space are needed for the reservation population. More community health nurses are also needed.

Northern Cheyenne Reservation

Social and community services provided on the Northern Cheyenne Reservation, described in the Northern Cheyenne Planning Office's report (August 1981), include--

- tribal government
- law enforcement
- health services
- water supply
- waste disposal
- fire protection

The Westmoreland Mine has had little effect on the Northern Cheyenne Reservation. (For a detailed description of six social and community services see the Final Comprehensive Environmental Impact Study, Western Energy Company's Rosebud Mine [July, 1983]). In general, tribal government and health services have enough personnel and operating space. Water supplies and waste disposal in some communities are not adequate and some systems need expansion or modification. Fire protection for forests and prairie is adequate, but building and auto fire protection is not. More personnel are needed in the Northern Cheyenne Police Department.

FISCAL CONDITIONS

Big Horn County Government

In fiscal year 1982 (July 1981-June 1982), about 84 percent of Big Horn County's general fund revenues came from local sources. The remaining 16 percent came from intergovernmental transfers (fig. II-13). Property taxes were the largest local source, providing about $1.5 million (59 percent) of total revenues. Other local sources included licenses and service charges, fines and forfeitures, and miscellaneous revenues (Mountain West Research-North [MWR-N], 1983, p. 3-89).

Property taxes are generated by a mill levy on the county's property tax base (taxable value). The coal industry provided more than 80 percent of the county's tax base in fiscal year 1982 (Montana Department of Revenue, 1983, p. 9). The largest source of taxable value was the gross proceeds value of coal production, which is defined as 45 percent of the contract sales price per ton times the taxable tonnage sold.

The Absaloka Mine provided about 13 percent of the county's tax base in fiscal year 1982. The gross proceeds value of the coal produced at the mine during calendar year 1981 made up 11 of the 13 percent (Montana Department of Revenue, 1983, p. 9, and John Hodnik, Mountain West Research-North, written commun. Sept. 19, 1983).

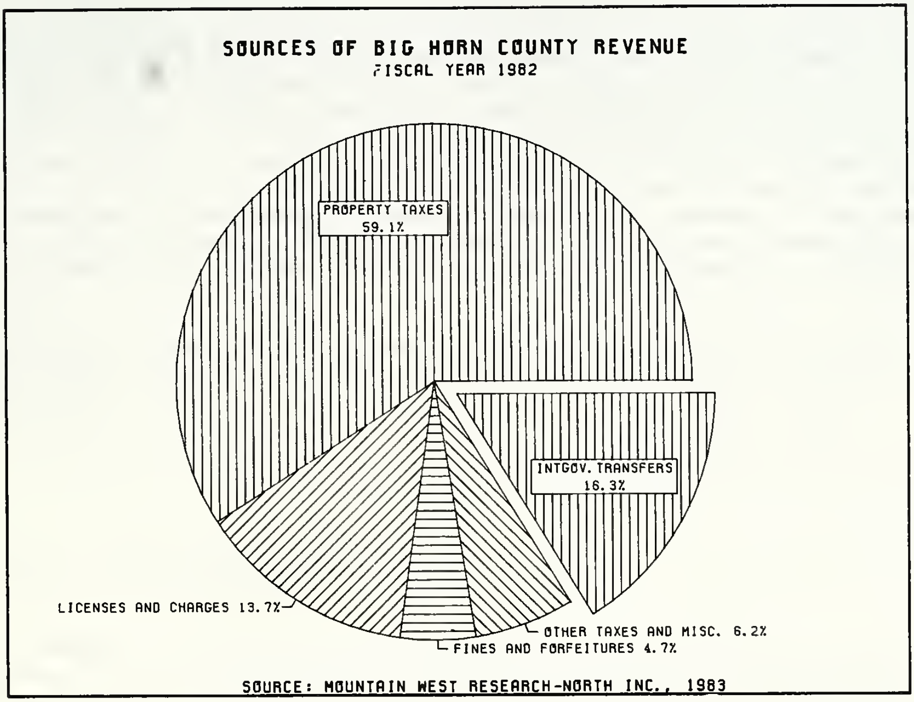


FIGURE II-13

Most of Big Horn County's revenue comes from within the county. But a significant amount, intergovernmental transfers, comes from outside, "nonlocal," sources.

The county's tax base rises and falls with the rate of coal production and coal prices. Between fiscal year 1981 and 1982, for example, the gross proceeds value rose from about $71 million to $91 million, accounting for most of the change in total county taxable value from about $108 million to $124 million (Montana Department of Revenue, 1983, p. 9). The increase came mostly from expansion at the Spring Creek Mine. Because production fell sharply in 1982, fiscal year 1983 gross proceeds taxable value will fall sharply, to about $81 million (Montana Department of Revenue, quarterly coal production report, unpublished).

In recent years, county spending has risen faster than inflation. Both total and per capita expenditures have grown an average 20 percent per year (MWR-N, 1983, p. 3-88). The county is now taxing about 34 mills, including about 15 for the general fund, 12 for the road fund, 3 each for the poor fund and bond retirement, and 1 for bridges (MWR-N, 1983, p. 3-90). Since the general fund is limited to 25 mills, the county has about 10 more mills available to fund future cost increases.

City of Hardin

The city of Hardin has no particular problems managing its finances. Because the city relies mainly on property taxes for revenue, however, it could have difficulty paying for any sudden jump in expenses caused by growth. The difficulty would stem from the inherent lag in the property tax base: Revenues, based on taxable value, would go up only after expenses. An additional problem for Hardin could come from a mismatch between the location of growth and the location of taxable value. That is, the coal development that could fuel the city's growth would occur outside the city's taxing jurisdiction; the growth would raise expenses but not directly add to the tax base (MWR-N, 1983, p. 3-144).

In fiscal year 1982, about 75 percent of the city's general fund revenues came from local sources. The remaining 25 percent came from nonlocal sources such as intergovernmental transfers. Property taxes were the largest local source, providing about $204,000 (46 percent) of total revenues. Other local sources included licenses and permits, fees and charges, other taxes, and miscellaneous revenues (MWR-N, 1983, p. 3-141).

The city operates water, sewer, and garbage utilities, each completely supported by user fees and charges. System revenues have been more than sufficient to cover costs, including debt repayment (MWR-N, 1983, p. 3-144).

The city's tax base (adjusted for inflation) has declined slightly since 1980. The decline is probably due to the court-mandated 12 percent reduction in the taxable value of commercial establishments. Despite the decline, the total municipal property tax levy has dropped 7 mills since 1980. As a result, total revenues (and budget) have also declined. Hardin now levies about 61 mills of the maximum allowable 65 mills for general purposes. It levies 22 more mills for special purposes, such as capital improvements, firemen's pension funds, city-county planning, parks and playgrounds maintenance, and insurance.

Crow Reservation

In fiscal year 1983, about 54 percent of the tribe's revenues came from local sources. The remaining 46 percent came from nonlocal sources, chiefly federal government grants and federal contracts to provide services to tribal members. Royalties paid by Westmoreland Resources were the largest local source, providing about $2.4 million (40 percent) of total revenues. Other local sources included oil and gas leases and royalties, grazing and land leases and interest (MWR-N, 1983, p. 3-171).

Sixty percent of the coal royalties must be distributed to tribal members and 20 percent must go to land purchases. As a result, most revenue for government services and programs comes from sources other than royalties, principally federal contracts and grants. In recent years, the availability of federal revenue has dropped sharply: The fiscal year 1983 figure of about $2.4 million is only a fraction of the $10 million taken in during most previous years (MWR-N, 1983, p. 3-170).

The Crow Tribe does not tax its members, and thus has no means of internally funding major capital improvements. Most of the major capital improvements made on the reservation come from direct contracts or grants from the federal government (MWR-N, 1983, p. 3-170).

School Districts

Most funding for operating the school districts in Big Horn County comes from some combination of four sources: countywide property taxes, district property taxes, state equalization money, and federal impact payments. The minimum funding amount per student is set by the Montana Legislature. This amount depends on the total number of students in a school district and the district's school level, elementary or high school. Districts with fewer students have a higher per-student funding, and high school districts get more per student than elementary districts.

Eighty percent of the minimum school funding comes from a mandatory mill levy on all the taxable property in the county. If resulting revenues do not cover 80 percent of the minimum, the state equalization fund pays a supplement. If the revenues cover more than 80 percent, the county pays the excess to the state equalization fund.

Before coal development began, Big Horn County received state equalization funds. At that time, the county had a low per-student taxable value because much of the land and property in the county is on an Indian reservation and not generally subject to property taxes. (See fig. II-12.) Since then, the enormous taxable value of the Decker area mines and the Absaloka Mine have reversed the flow of funds. About 32 percent of the money raised in the county in 1982 was paid into the equalization fund.

Until 1983-84, the mandatory Big Horn County mill levy stood at 40 mills, 25 for elementary districts and 15 for high school districts. Beginning in 1983-84, the mandatory levy is 45 mills, 28 for elementary districts and 17 for high schools.

The 20 percent of minimum funding not provided through the mandatory levy is provided by an additional tax on property in the individual district. This property tax, called the permissive levy, can only be enough to complete minimum funding, up to as much as 9 mills for elementary districts and 6 mills for high schools. If the revenue raised through the permissive levy does not complete the minimum, the state equalization fund makes up the difference.

To raise the budget above the amount provided by the equalization minimum, and to fund the other functions of the schools, the district can tap a variety of sources. The main local source is an increase in the property tax, which must be approved by the voters. Other sources of income are a variety of combinations of state, county, district and federal sources. Transportation, special education, capital improvements, and other functions are the primary items funded by these extra monies.

School districts that are directly affected by federal projects or that contain federal employees qualify for federal impact assistance. The assistance, which comes in the form of "PL 874" money, is provided for by a program established by Public Law (PL) 874. Since the Crow and Northern Cheyenne Reservations are considered federal impact areas, school districts with Indian students may apply for PL 874 money. This money goes directly to the school district. It does not necessarily affect the level of district and state foundation funding.

The Absaloka Mine is located in elementary school district 17-H and high school district 1. (See fig. II-12.) Before development at the Absaloka Mine (1970-71), most revenues for schools came from outside the county: 38 percent came from the state and 22 percent from the federal government. Only 37 percent of the elementary district's general fund revenue was raised in the districts, and 4 percent came from property taxes elsewhere in the county (fig. II-14).

The addition of the Absaloka Mine to the tax rolls and changes in state law that implemented the Gross Proceeds tax redistributed the tax burden. The responsibility for school funding shifted into the district and rest of the county. (See 1974-75 in fig. II-14.) By the 1981-82 school year, the state and "elsewhere in county" roles were reversed, and the local district was responsible for a much higher proportion of school funding.

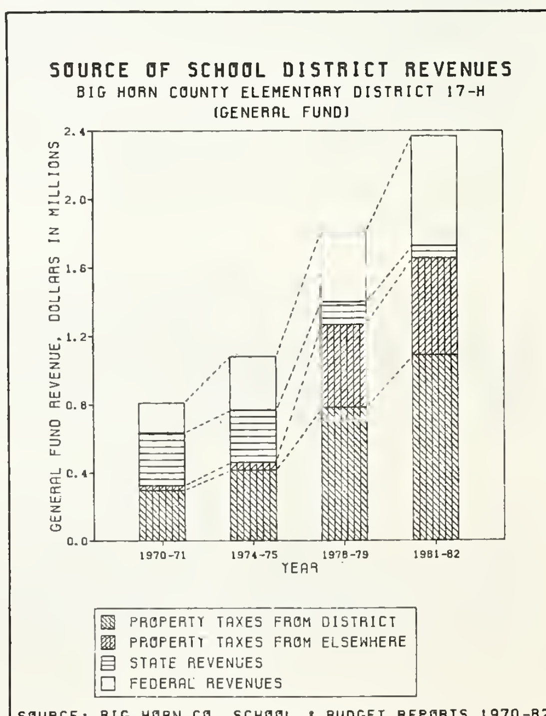


FIGURE II-14

The sources of elementary district 17-H's revenues show a shift in funding responsibility: The state's support has dropped to near zero; funding from within the district itself and from elsewhere in the county has increased accordingly. The school district is, in a sense, fiscally self-sufficient, owing to the high taxable value of both the Absaloka Mine and other mines elsewhere in the county.

In school year 1981-82, general fund revenues for elementary district 17-H totalled $2,369,498. The bulk, 46 percent ($1,089,364), came from property taxes paid in the district through the mandatory, permissive, and voted levy. Twenty-four percent ($567,402) came from property taxes paid elsewhere in the county through the mandatory levy. Twenty-seven percent ($641,268) came from the PL 874 program, and the remaining 3 percent ($71,464) came from the state through the school equalization fund. The high school district had a similar revenue pattern (fig. II-15).

State Revenues

Almost all revenue received by the state of Montana from coal development is based on the value of the coal sold. The state levies four main taxes: Coal Severance, Resource Indemnity Trust, a six-mill property tax, and the Corporate License Tax (an income tax). The state school trust also receives royalties from the state-owned coal that is mined at the Absaloka Mine.

The severance tax, 30 percent of the contract sales price, generates the most revenue for the state (table II-15). The contract sales price equals the gross sales price less production taxes and an adjustment for royalties paid.

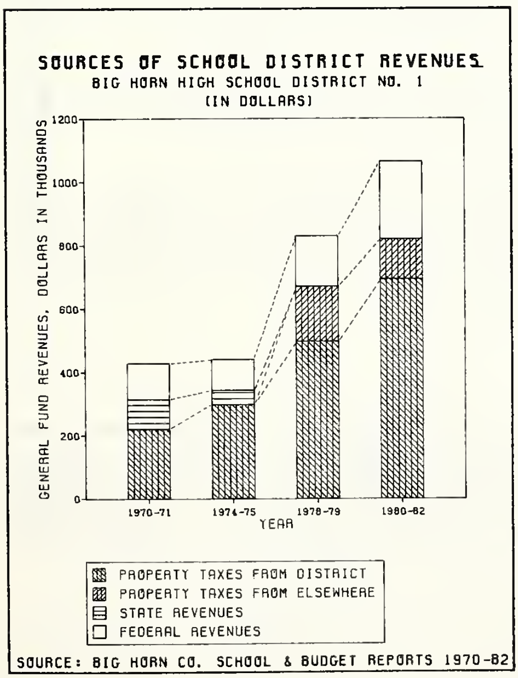


FIGURE II-15

Revenue sources in high school district 1 closely resemble those of elementary district 17-H. Note in the 1978-79 fiscal year the disappearance of state revenues and sudden appearance of revenues from elsewhere in the county.

TABLE II-15

Summary of Tax and Royalty Payments Made
By Westmoreland Resources, Inc., 1980-82

	State of Montana			Crow Tribe	Federal Government	
Year	Severance Tax	Royalties	Property Taxes	Royalties	Black Lung	Abandoned Mine
1980	$8,612,038	$341,598	$1,743,214	$1,662,953	$829,985	$1,716,841
1981	9,030,946	208,276	1,768,148	2,128,096	884,855	1,557,603
1982	9,118,901	40,572	1,706,447	2,701,697	1,788,464	1,455,727

Sources: David W. Simpson, Westmoreland Resources Inc., written commun., Nov. 19, 1982, oral commun., Oct. 4, 1983; Montana Department of Revenue, unpublished quarterly report; John Hodnik, Mountain West Research-North, written commun., Sept. 19, 1983.

In the fiscal year ending June 30, 1981, the Coal Severance Tax produced about 16.5 percent of all the state's tax revenue and about 4.6 percent of total receipts (Montana Department of Administration, 1981, p. 23). The revenues raised through the tax are used in a variety of ways. These uses have changed in the past, are scheduled to be changed in the future (table II-16), and no doubt additional changes will occur from time to time. The principle function of the tax is to convert a lump sum yearly payment into continuous income. This is accomplished by the distribution of the tax into a series of special purpose trust funds which in turn are managed by the state to produce investment income. The tax revenue is an important support of other interests of the state in areas of general and special government services.

Royalties on state-owned coal mined at the Absaloka Mine are the next largest revenue producer. Royalties are paid at the rate of 17.5 cents per ton.

The remaining three taxes produce far less income for the state. The Resource Indemnity Trust tax is 0.5 percent of the contract sales price. The six-mill property tax is based on the gross proceeds and other taxable value at the mine. It goes to support the university system. The Corporate License Tax is levied at the rate of 6.75 percent on the net income of corporations.

Federal Revenues

The Federal government receives revenue from the corporate income tax, the Black Lung Excise tax, and the abandoned mines reclamation fee. The corporate income tax varies with the company's year-to-year profits. The Black Lung Excise tax is calculated as 4 percent of the gross sales or f.o.b. (freight on board) price of the coal. The abandoned mines reclamation fee is $0.35 per ton of coal.

TABLE II-16

Disposition of the Coal Severance Tax
(data are in percent of total collection)

	July 1, 1977- June 30, 1979	July 1, 1979- Dec. 31, 1979	Jan. 1, 1980- June 30, 1986	July 1, 1986- June 30, 1987	July 1, 1987 June 30, 1993
Constitutional Trust Fund	25.0	25.0	50.0	50.0	50.0
General Fund	30.0	28.875	19.0	16.72	14.44
Local Impact and Education Trust Fund	19.875	28.125	18.75	16.5	14.25
Coal Area Highway Improvement	9.75	0	0	0	-0-
Highway Reconstruction Trust Fund	0	0	0	6.0	12.0
State Public School Equalization	7.5	7.5	5.0	4.4	3.8
Alternative Energy Research Development and Demonstration	1.875	1.875	2.5	2.2	1.9
Renewable Resource Development Bond Account (Sinking Fund)	1.875	1.875	1.25	1.1	0.95
Parks and Art Trust Fund	1.875	3.75	2.5	2.2	1.90
Producing County	1.5	1.5	0	0	0
County Planning (Statewide)	0.75	0.75	0.5	0.44	0.38
State Library Commission	0	0.75	0.5	0.44	0.38

LAND USE PATTERNS

Land use patterns in Big Horn County changed little during the coal development period of the 1970s. Agriculture, although declining in area covered from 87 to 86 percent, remained the dominant land use (Mountain West Research-North, Inc. [MWR-N], 1983, p. 3-47).

The changes in land use were concentrated in towns and at minesites (MWR-N, 1983, p. 3-47). Growth outside incorporated areas has generally occurred in scattered parcels (MWR-N, 1983, p. 3-48). One new town--Spring Creek--was planned: It received the necessary permits, was platted, had streets cut to grade, and sewer and water systems and trunk lines installed (MWR-N, 1983, p.3-51). To date, the town has not attracted any permanent residents.

The county seat, Hardin, has expanded its corporate boundaries through annexation. Growth in or near the city has been relatively orderly, because zoning and subdivision regulations are enforced (MWR-N, 1983, p. 3-47,3-48).

The mines in Big Horn County today--Absaloka, Decker and Spring Creek--have approval to mine 16,559 acres. The mine companies have submitted applications for permits on another 6,283 acres (Department of State Lands, April 1, 1983). The combined 22,842 acres have been, or would be, temporarily converted from agriculture to coal mining activities. This acreage makes up about 0.7 percent of the county's total acreage (MWR-N, 1983, p. 3-49).

The application area is located on the 15,386-acre leasehold made up of the Crow Tract III and a state section (number 36) (fig. II-16). The land use pattern of the application area is generally similar to that of the entire leasehold (fig. II-16 and table II-17). The major difference is that the application area has a greater proportion of cropland and ponderosa pine and a lesser proportion of rangeland and other uses.

The average condition of the grazing land in the present permitted area and the application area is fair. (Grazing land includes grassland, open-canopy ponderosa pine, riparian, and deciduous tree and shrub type, and disturbed grassland. See table II-5.) The area has a recommended stocking rate of 0.23 animal unit months (AUMs) per acre, yielding about 484 AUMs of grazing capacity (Westmoreland Resources, 1983, bk. E, ex. E-6). The cropland has some additional forage potential in aftermath grazing. The application area is in similar condition and has a recommended stocking rate of about 0.26 AUMs per acre, yielding 85 AUMs of total grazing capacity. Aftermath grazing would add an additional 25 AUMs.

The cropland in the application area has a predicted average yield of 15 bushels per acre of wheat or 22 bushels per acre of barley, or 1 ton per acre of alfalfa hay (Westmoreland Resources, 1983, bk. E, ex. E-7). Average annual production for the application area would be about 1,000 bushels of wheat (or 1,500 bushels of barley) and 88 tons of alfalfa hay.

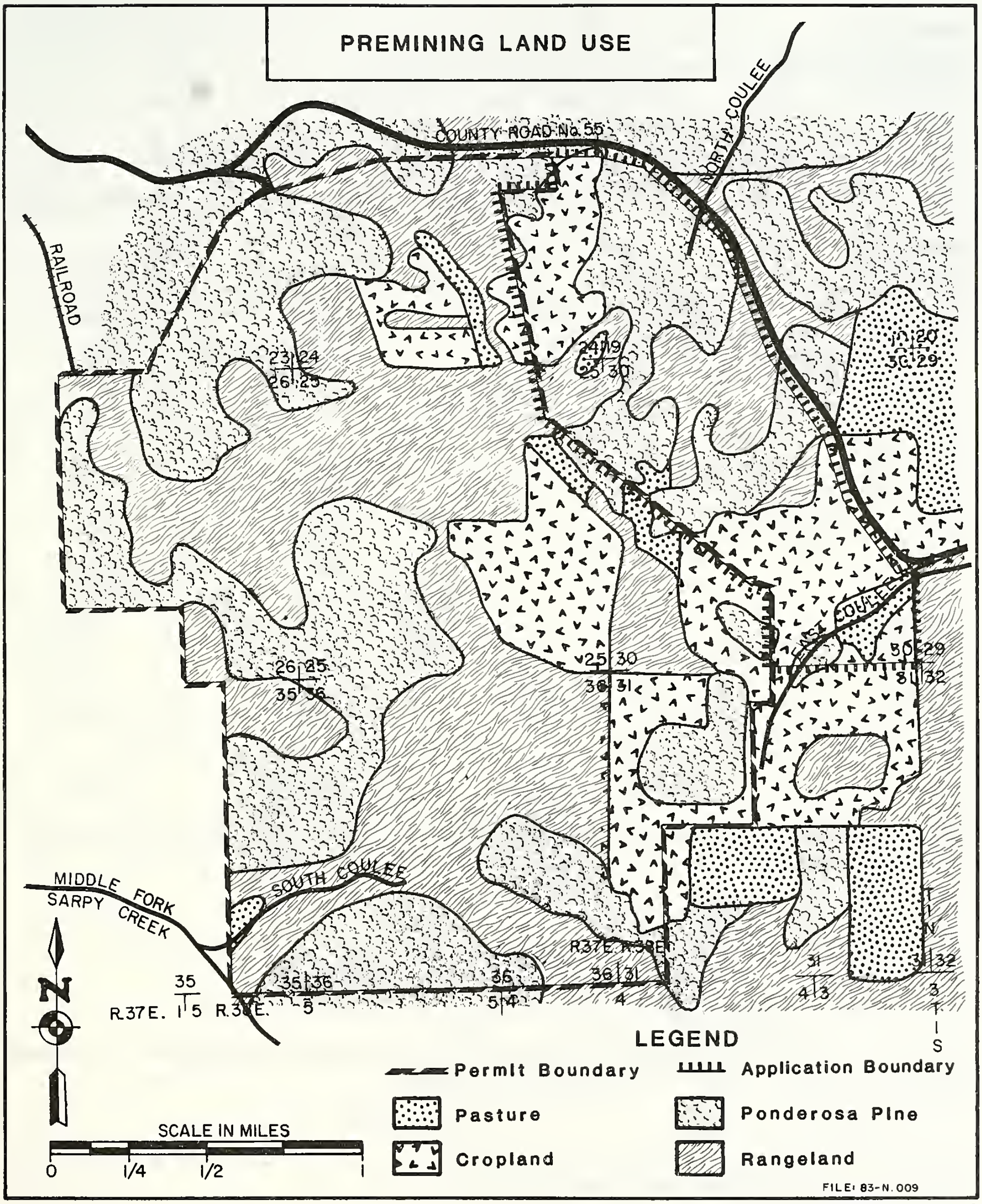


FIGURE II-16

Land uses in the Absaloka Mine area are divided between grazing land (pasture, ponderosa pine, and rangeland) and cropland. The bulk of the area is used for grazing.

TABLE II-17

Land Use Pattern in Tract III and State Section 36
(in acres)

	Premining Total[1]	Existing Total[2]	Postmining Total[3]
Undisturbed			
Rangeland[4]	8,800	8,181	6,020
Cropland	1,662	1,463	547
Ponderosa Pine	3,385	2,810	1,949
Other	1,539	1,539	1,515
Subtotal	15,386	13,993	10,031
Disturbed			
Active Mining	0	650	0
Facilities & Construction	0	265	0
Associated Disturbance	0	101	0
Other	0	101	0
Subtotal	0	1,117	0
Reclaimed[5]			
Rangeland	0	257	5,066
Cropland	0	0	0
Ponderosa Pine	0	14	261
Other	0	5	28
Subtotal	0	276	5,355
TOTAL	15,386	15,386	15,386

Sources: Michelle D. Mitchell, Westmoreland Resources Inc., written commun., September 6, 1983; oral commun., September 13, 1983; January 24, 1984.

[1] January 1972.

[2] January 1983.

[3] Ending in 2016.

[4] Includes some open stands of ponderosa pine.

[5] Areas outside those currently permitted or applied for were assumed to be reclaimed to rangeland; some Ponderosa pine and cropland would probably be replaced.

TRANSPORTATION NETWORKS AND TRAFFIC FLOWS

Roads and Highways

Big Horn County has 81 miles of interstate (I-90), 79 miles of primary, 160 miles of secondary, 900 miles of county and 375 miles of Indian and national roads (Mountain West Research-North, 1983, p. 3-29). (See fig. II-17.) The

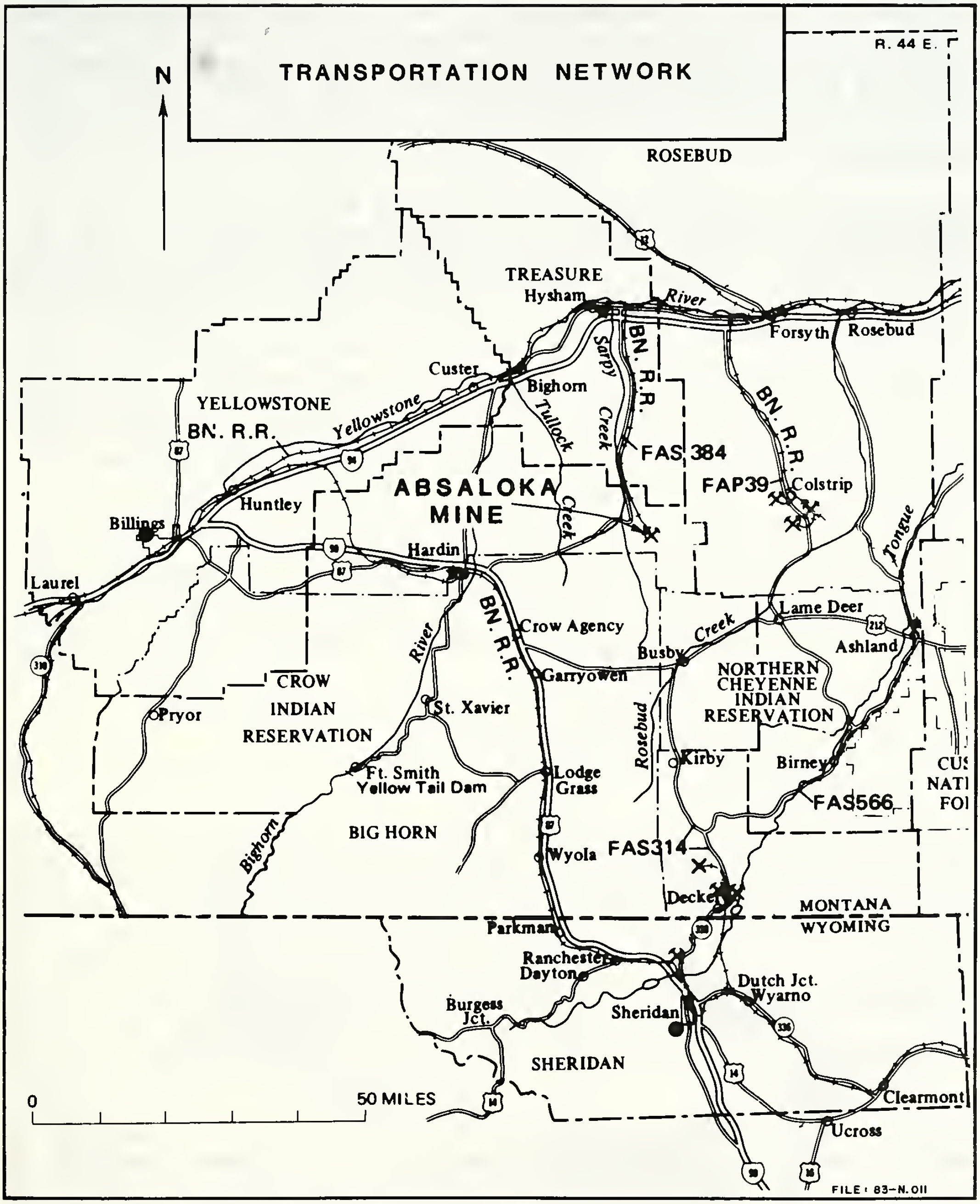


FIGURE II-17

The Absaloka Mine is served by FAS 384. Westmoreland ships all coal on the Sarpy Spur, the railroad line that extends north from the mine to the Burlington Northern mainline along the Yellowstone River.

Absaloka Mine is reached via Federal Aid Secondary (FAS) 384 and County Road 55 (fig IN-1). FAS 384 functions well for the terrain and vehicles now using the route. FAS 384 was completely reconstructed in 1977 and 1978. The part between Hardin and the mine had an average daily traffic (ADT) of between 400 and 440 in 1981 (Montana Department of Highways, 1981, p. 198).

Rail Network

The Absaloka Mine is connected to the Burlington Northern mainline by a spur. Currently, an average of about 16 unit coal trains per week (8 each way) travel the spur. Train traffic heads east after reaching the Burlington Northern mainline. The train traffic contributes to the increasing congestion at railroad crossings that are not separated by over or underpasses in towns to the east of the junction.

Ranchers along the spur line have reported some problems, such as overall inconvenience, trespass and litter during construction, minor erosion around culverts, and some accessibility restrictions. One grass fire was believed to have been caused by a train (Alan Newell, Historical Research Associates, written commun., Dec. 16, 1982).

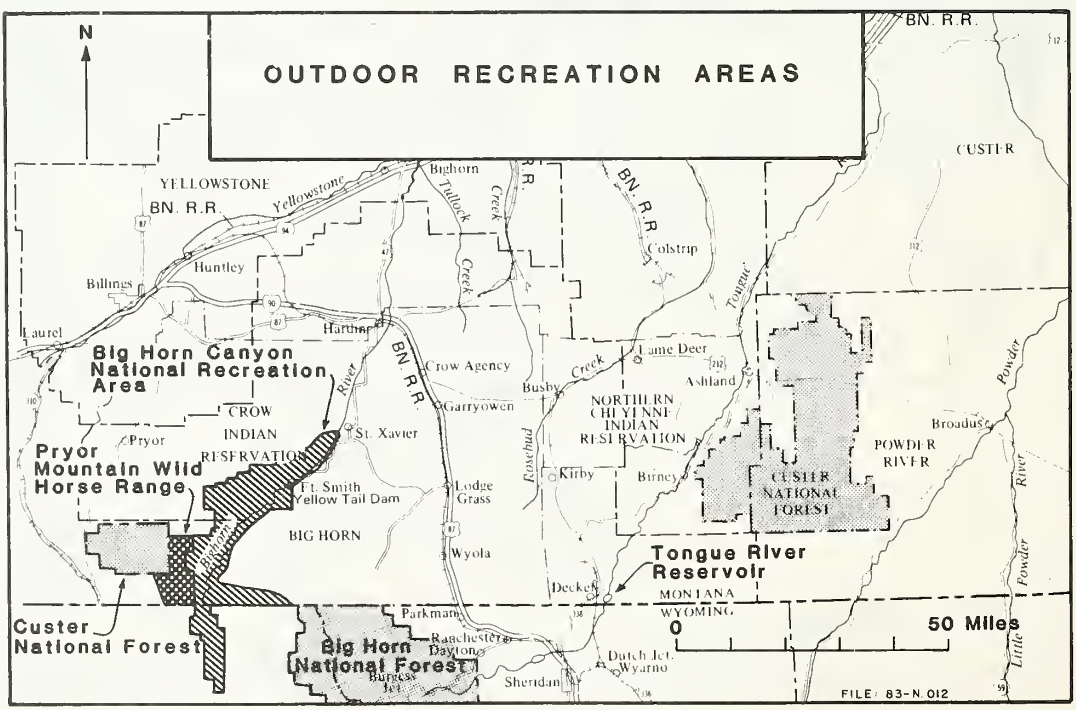


FIGURE II-18

Within a day's drive of the mine are a number of public recreation areas. The largest is Big Horn National Forest, which lies mostly within Wyoming.

OUTDOOR RECREATION

Bighorn Canyon National Recreation Area, Bighorn National Forest, and Custer National Forest provide the bulk of land for outdoor recreation in the region surrounding the Westmoreland Mine (fig. II-18). Added to this in Big Horn County are four fishing access sites, the Tongue River Reservoir, and several historic preserves. (See app. D, table D-4, for a complete list.)

Taken as a whole, the capacity of regional outdoor recreation areas appears adequate to accommodate current recreational activities (Mountain West Research-North, Inc., [MWR-N], 1983, p. 4-43). Montana Department of Fish, Wildlife and Parks estimates of statewide recreation rates and trends indicate that the supply of recreation areas is adequate. Bighorn National Forest supply and demand data lead to similar conclusions. On a regional level, present demand does not cause overcrowding or overuse of outdoor recreational areas, based on the capacity levels and management objectives of state and federal agencies.

In local areas, in contrast, some shortages may arise. Unequal distribution of people (over the days of the week, months of the year, sites, and activities) occasionally causes overcrowding. Some camping and picnic areas in Bighorn National Forest reach capacity on weekends. In the Cloud Peak Primitive Area, foot trails are traveled heavily, more than anywhere else in Bighorn Forest. At the Bighorn Canyon National Recreation Area, where an estimated 77 percent of visitors come from Wyoming and Montana, camping and boating sites reach capacity during five to six weekends a year (National Park Service, 1981).

CULTURAL RESOURCES

Cultural resource surveys conducted in 1972 (Fredlund and Fredlund) and 1975 (Wirth and Associates) yielded inventories of the entire Tract III area (fig. IN-1). The prehistoric remains identified include porcelanite quarry sites, habitation sites, rock shelters, lithic scatters, rock art sites, stone ring sites, and observation/hunting blind sites. Several of the sites were collected and tested and others (24BH149 and 24BH1728) were partially excavated. There are no recorded prehistoric sites within the application area. Several prehistoric sites are located in nearby areas but they are not eligible for nomination to the National Register of Historic Places. No sites were identified that might have religious signficance as defined by the Native American Religious Freedom Act.

Although the region has a colorful history associated with the opening of the frontier (trading posts, forts and battle sites), the Absaloka Mine area is dominated by sites of later periods associated with homesteading and settlement. Six historic sites (five homesteads and Second Sarpy School) are located in the application area but none are considered eligible for the National Register. Other historic sites are located nearby, but they, too, have been classified as not eligible.

AESTHETICS

A rolling patchwork of rangeland, ponderosa pine woodlands, and dry cropland covers the Absaloka Mine area. Cutting the rolling topography are shallow draws that grow with thickets of lush plants. The dominant features of the landscape are dark green, irregular groups of ponderosa pine. Overall, the scenery is pleasing and interesting.

The landforms of the life-of-mine area are mostly subtle. The only exceptions are nine groups of sandstone outcrops on the eastern side of the life-of-mine area. The outcrops rise abruptly from treeless grasslands. Some form 20- to 40-foot colored pedestals, visible in places for a mile or more.

Few structures predating the mine lie in the life-of-mine area. Those present--barns, fences, houses, outbuildings--were built for ranching and farming. The structures blend with the rural agricultural surroundings.

The landscape of the mine area is common in the plains region on the eastern side of the Rocky Mountains in Montana. Some nearby areas are less scenic--the flat agricultural lands between the Bull Mountains and the Yellowstone River. But many areas are more scenic--the Little Wolf Mountains, Bighorn Mountains, Yellowstone River, and the Bighorn Canyon and River (Westmoreland Resources, 1983, bk. E). The more scenic terrain offers denser vegetation, rougher topography, and more varied colors.

The mine area is closed to the public and can be seen only from the county road around the mine border. Even on the road, pine stands and hills hide most of the minesite.

To date, the Westmoreland has disturbed about 1,000 acres, 650 of which have been excavated for mining. Within the mine, the impacts of the mining are obvious: giant machinery, deep mine cuts, spoil piles, the coal plant, and the railroad.

The company has so far reclaimed 300 acres. The reclaimed lands look like rolling grass-covered hills, without ponderosa pine woodlands. The reclaimed topography is similar to what existed before mining, but the vegetation is, at the present stage of reclamation, much less diverse.

IMPACTS OF WESTMORELAND'S PROPOSAL

This chapter covers 19 topics, presenting subject by subject the impacts--mostly unavoidable--that could be caused by the application and life-of-mine plans. At the start of each topic is a summary of the major impacts anticipated to be caused by the mine plans. Following the summary is a detailed discussion of the impacts. Each section ends, when appropriate, with a list of "mitigating measures," or actions that could be taken to reduce or eliminate the mine's projected adverse impacts.

GEOLOGY

Summary of Impacts: Throughout the mine area, some erosion and sedimentation of reclaimed lands would be unavoidable. The two permanent impoundments proposed to replace the springs destroyed or dried up by mining would probably function as intended with long-term maintenance. Moderate problems with drainage system stability may eventually arise.

The company's application plan would establish a postmining rootzone that is acceptable for plant growth. Some of the rootzone spoil could contain elevated levels of molybdenum, which in turn could cause a copper-molybdenum imbalance in forage.

Topography and Geomorphology

Geomorphic impacts under the proposed mine plan would be moderately significant. The two proposed permanent impoundments may lead to drainage stability and sedimentation impacts. Unless the impoundments receive regular maintenance, the useful life of the features would probably be less than an estimated 100 years. It is important to note, however, that the impoundments would probably function and have a useful life comparable to other similar structures in southeastern Montana.

In the application area, the loss of springs and the destruction of the current ground water system (see Hydrology), in conjunction with expected increased runoff from the postmining surface, would probably establish a more definable surface drainage network above the proposed permanent impoundments than what now exists.

Under the life-of-mine plan, geomorphic impacts would probably be similar to those of the proposed plan. The greater drainage density created naturally

on the reclaimed surface, along with the elimination of an additional ten springs, would result in increased erosion in the coulee bottoms and sporadic, slightly increased sediment loads to East Fork Sarpy Creek. These impacts would require possibly several decades to centuries to fully develop.

Unavoidable erosion and sedimentation on the reclaimed surface would result from the disturbance of soils, grading and compaction of the post-mining surface, and increased water runoff. These problems are typical of any surface mine in a semiarid environment, and would last until hydrologic stability is reestablished.

Mineral Resources

Under the proposed mine plan, approximately 65 million tons of coal would be mined from an additional 573 acres within Tract III. Some coal would not be recovered, owing to the limits of present technology (U.S. Department of Interior, 1977).

The coal mined under the life-of-mine plan (2,096 acres) would amount to 30 percent of the total economically recoverable reserves in Tract III (15,386 acres), and about 1/2 of 1 percent of the estimated strippable reserves in the northern Powder River coal basin. Mining would recover about 90,500 tons/acre--about average for strip mines in southeastern Montana.

Other Geologic Impacts

The existing stratigraphy down to the lowest coal seam mined would be replaced by a mixed mass of broken rock with greater porosity. The existing stratigraphy, however, is not unusual and has no intrinsic value.

Mining would not interfere with development of other minerals: none of significance are known at the minesite. Any possible reserves of oil and gas would occur in rocks beneath those to be mined. Clinker would be disturbed by mining, but this material is common throughout the region. Mining would not create any geologic hazards of consequence. Coal fires would be a potential hazard during mining; but the hazard would be minor, because Westmoreland is committed to extinguishing fires when they occur. After reclamation, coal fires would be highly unlikely.

No paleontological resources of importance are known to exist in the rocks of the Fort Union formation that would be mined.

Overburden

Overall, Westmoreland's proposal would establish a postmining rootzone that would be acceptable for plant growth. (The rootzone includes the top 8 feet of replaced overburden, or spoil.) However, the company should take steps to avoid a potential problem caused by molybdenum.

Sodium

The major concern with sodium at the Absaloka Mine is in the interburden. The interburden is generally mixed with overburden during excavation to expose the Robinson coal seam. At this time the dragline rehandles Rosebud-McKay overburden and interburden, placing it at the top of the spoil piles. Westmoreland's experience to date has indicated effective mitigation of sodium levels by interburden mixing with overburden (Westmoreland Resources, 1983).

In the northeastern part of the application area, the company would be mining the Robinson coal only because the Rosebud-McKay has burned out. Although no overburden cores were taken in this area, the lower part of the overburden here is probably similar to the interburden farther west (i.e. sodic). Since only one seam would be mined in this area, less rehandling of material, and therefore less mixing, would take place. This would increase the chances of sodic spoil being placed in the rootzone.

While Westmoreland's stripping procedures may provide a generally favorable spoil surface (i.e. rootzone), small to moderate areas of sodic material still could end up in the rootzone. Even where this occurs, however, no serious impacts are anticipated. The soils proposed for reclamation, although mostly sandy, are of good chemical quality. In addition, the overburden/interburden mixture is not dominated by swelling clays, and would probably maintain good hydraulic conductivity (water movement) over time. Dollhopf et al. (1980) have shown that in similar situations little, if any, upward salt migration occurs. Therefore, no soil or plant degradation is expected to take place.

Molybdenum

Molybdenum levels slightly exceed the draft 1983 Department of State Lands suspect level in about half of the overburden samples tested. The Department requires testing for molybdenum because the metal can lead to molybdenosis in livestock--a disease caused by a copper-molybdenum imbalance often attributed to high molybdenum concentrations in forage. (Note that the interrelationships of dietary molybdenum and copper have given rise to a number of specific terms Dye and O'Harra, 1959, p. 5). For the sake of simplicity, only one term, molybdenosis, will be used in this text.) Although molybdenum levels in some application area cores exceed the proposed suspect level, molybdenosis would not necessarily occur.

The difficulty of any projection of molybdenosis stems from the complexity of molybdenum toxicity. This complexity, in turn, stems from several factors. Research indicates that the disease arises not only from excess molybdenum, but also from low levels of available copper and high sulfate-sulfur concentrations in forage (Gough et al., 1979). The most critical parameter is the copper:molybdenum ratio in forage. Plant uptake of molybdenum and copper is complicated by soil and environmental factors. The levels at which molybdenum in the soil or spoil would cause molybdenosis in cattle cannot, therefore, be specified precisely.

The company's reclamation plan would greatly decrease the chance of molybdenosis. First, the company proposes to place at least 3 feet of chemically favorable soil over the spoil. This would decrease the amount of molybdenum uptake. Second, few leguminous plants--known molybdenum accumulators--are proposed for the revegetation seed mixtures. This would reduce the amount of molybdenum in forage. These two measures would greatly reduce the chances of molybdenosis, but not altogether eliminate the potential for the disease. (See Mitigating Measures.)

Blooms of two leguminous plants--yellow and white sweetclover--periodically occur in reclamation areas. Wind-transported seed from adjacent fields is usually the source of these plants. The sweetclovers are known molybdenum accumulators and cattle grazing predominately on this vegetation could suffer from a metabolic imbalance resulting in molybdenosis (Erdman et al., 1978). This may be especially true on revegetated mine areas, where legumes, such as the sweetclovers, exhibit a tendency to accumulate even higher concentrations of molybdenum than legumes growing on native range or cultivated fields (Munshower and Neuman, 1978b). Since there appear to be no effective methods of controlling invading sweetclover on reclamation areas, it may be important to add copper supplements to the diet of grazing livestock. (See Mitigating Measures.)

Mitigating Measures

Two measures of reducing the chances of molybdenosis, mentioned earlier, are already included within the company's reclamation plan. To further lessen the chances of the disease, Westmoreland could ensure that mineral salt blocks contain trace levels of copper (as they normally do) so that cattle have an additional supply of copper in their diet to prevent symptoms of molybdenosis.

HYDROLOGY

Summary of Impacts: Seven springs would be removed by mining in the application area. At least three other springs would probably cease flowing during mining due to associated disturbances and lowered water tables. Three of these ten springs are apparently perennial surface water supplies. The proposed plan to restore the surface water supplies would be partially successful; therefore, the loss of springs would be permanent (with the likely exception of spring 12), reducing the mine area's surface water supply. In the life-of-mine plan, another 10 springs would be lost. Impacts to the local hydrologic system would be minimal. No impacts are likely to occur to East Fork Sarpy Creek.

Surface Water

The most significant impact on surface water in the application area would be the removal of seven springs in the North Coulee drainage. (See Ground

Water.) Spring numbers 4, 5, 7, 8, 9, 10, and 11 would be destroyed. Of these seven springs, two are considered perennial surface water sources. Springs 12, 13, and 277 would probably cease flowing as a result of a lowered water table (fig. II-2). Spring 12 is also considered a perennial water supply and is the largest spring in North Coulee. Other springs nearby would be affected negligibly, if at all. After mining, it is likely that seepage from one of the proposed permanent impoundments may recharge spring number 12, thereby offsetting to an unknown degree the loss to mining of this spring's present recharge area. Springs 13 and 277 may also recover after final reclamation of the local ground water system.

The life-of-mine plan would remove an additional 10 springs: numbers 13, 14, 15, 271, 272, 273, 277, 24, 25, and 29. The flow of springs 20 and 260 would markedly decrease or cease. (See Ground Water.)

Because most or all of the affected springs flow only a short, if any, distance down the coulee, mining's impact on surface water would be limited to the loss of the springs themselves. No direct impact during mining is likely on the intermittent surface flow of the Sarpy Creek system.

Another impact on surface water during mining would be the loss of surface runoff from the mining area. State and federal regulations require Westmoreland to limit surface discharge from mining areas. Accordingly, the company proposes to construct impoundments to control surface runoff from the mine. Under both the proposed and life-of-mine plans, the calculated loss of surface runoff to the Sarpy Creek basin would amount to less than 1 percent. The actual loss, however, would be less: Most or all runoff from North Coulee is probably lost to infiltration and evapotranspiration. The same losses would occur during mining.

After mining, surface runoff from the reclaimed surface is expected to increase by a measurable, although unpredictable, amount (Lusby and Toy, 1976). The total increase in surface flow would amount to a negligible change in the runoff of the East Fork drainage basin. Reclamation under the life-of-mine plan may eventually increase peak runoff flow to the East Fork of Sarpy Creek, but at the expense of base flow. This would not cause any measurable impacts to downstream agricultural operations.

Surface water would be impounded by sedimentation ponds in the application area. Total dissolved solids (TDS) in surface water draining to the East Fork of Sarpy Creek are not expected to increase significantly, because data collected by Westmoreland indicate that TDS concentrations in the existing main sediment pond are within the range of concentrations of surface water for adjacent, unaffected tributaries. The impact to the quality of water in the main stem of East Fork, due to proposed mining activities, would thus be insignificant.

The Montana Department of Health and Environmental Sciences has issued three surface water discharge permits to Westmoreland. The company, however, rarely discharges from the mine area. Moreover, periodic water quality monitoring to date has revealed no water quality problems.

Direct and indirect water consumption due to the mine would not conflict with other uses of water in the area. The Absaloka Mine now consumes about 200 acre-feet of water per year, most of which is obtained from the deep Madison aquifer. At the full coal production level of 10 million tons per year, consumption at the mine would reach about 250 acre-feet per year from the same source.

Westmoreland would build two permanent impoundments and drill two wells to replace springs lost by mining in the application area. The impoundments would be designed to contain surface runoff from reclaimed mined lands, thereby providing water for livestock and wildlife for several months of the year. Both of the impoundments would be constructed initially as sedimentation ponds for use during mining. Analyses indicate that under dry to average runoff conditions, the spring snowmelt expected to fill the smaller pond would evaporate or be lost to seepage within one or two months.

The other impoundment would be designed to retain snowmelt and rainfall runoff through the summer months under all but the driest climatic conditions. Based on available data and two separate analyses (Stiller and Associates, 1984a; Westmoreland Resources, 1983, bk. I, vol. 11), there is an estimated 90 percent probability that water would be in the pond through the summer every year. Stated differently, however, there is about a 35 percent probability that the pond would dry up during at least one summer in any 10-year period. Application of another method (Schwab et al., 1981, fig. 10.11) also suggests that pond 20 would be a reliable, although not infallible, water supply for livestock and wildlife after mining. Fewer seasonal water sources would exist. (See Land Use, Vegetation, and Wildlife.)

The impoundments would probably require regular maintenance to keep functioning properly. Without regular upkeep, the impoundments could be rendered inoperative by sediment deposition within 100 years. Whether postmining landowners would indefinitely maintain the impoundments is questionable. However, it is notable that most of the springs in Tract III appear to have been developed and maintained by ranchers over the past decades. With or without mining disturbances, these spring developments would also have to be maintained in the future if the springs were to remain as useful water sources for livestock and some wildlife species.

The postmining surface water drainage network proposed by Westmoreland for the application area would be similar in design to the premining drainage system. The reconstructed drainages would have a generally concave configuration that would limit the potential for excessive erosion. The initial reconstructed density of the postmining drainages would be slightly less than the present system and thus may not provide adequate avenues for surface runoff. This would lead to increased erosion and sedimentation as the drainages develop their own runoff networks.

Reclamation under the life-of-mine plan may eventually result in increased total suspended sediment concentrations in the East Fork of Sarpy Creek. (See Geology, Geomorphology.) The extent and the timing of the increase is uncertain. Whether the increase is avoidable under the very best reclamation practices is also uncertain.

Ground Water

The most serious impact on the ground water system from application area mining would be the destruction of the ground water flow system which supports numerous springs in North Coulee. (See Surface Water.) This impact would probably be locally significant, because it would reduce ground water flow within the North Coulee system and lower the ground water table. These conditions and a predicted general lowering of the coulee bottom water table may be offset by seepage from the two permanent impoundments, which would be constructed mostly on unmined surface. Seepage would be lost partially to underlying spoil and partially to the remaining coulee bottom sediments beneath the ponds. The seepage moving through unmined coulee bottom sediments would flow down-coulee beneath the dams and eventually toward spring 12 (fig. II-2). Therefore, spring 12 would probably recover after mining. Whether spring 12 would ever again be a perennial water supply, however, is unknown, although the coulee bottom water table may be close enough to the surface that spring 12 could be made perennial by deepening the present excavation at the spring. Water quality would probably be at least as good after mining as before.

The ground water system would be most affected at the head of North Coulee, where about two-thirds of the total drainage area would be destroyed by mining. Impacts would decrease with increasing distance down the coulee (away from the proposed mine area), because of the increasing importance of the water contributed by the undisturbed ground water basin, the diminishing influence of pit drawdown, and because a significant amount of the Rosebud-McKay clinker would not be disturbed by mining. Because North Coulee provides so little water to the East Fork of Sarpy Creek system, however, no hydrologic impact on the East Fork of Sarpy Creek would result.

Mining in the life-of-mine area would cause more impacts on the East Fork of Sarpy Creek ground water basin, but these would not be significant. A 1,000-foot section in the northeast corner of the life-of-mine area would come within several hundred feet of the East Fork of Sarpy Creek valley floor. Induced ground water flow that may occur from the alluvial ground water system toward the mine pit in this area is estimated to be less than 10 gpm. This minor flow rate would cause little or no water level declines in the alluvial ground water system.

Hundreds to thousands of years would be required after mining for ground water systems in the spoil (replaced overburden) to re-equilibrate to approximate premining conditions. Postmining ground water flow through the mine spoil would most likely not reestablish the springs removed by mining. Ground water moving through the spoil would probably flow down the base of the mine floor, which is the structural base of the Robinson coal. Ground water entering the spoil from unmined coal and overburden to the south would eventually enter undisturbed units to the north and east. A ground water flow system, possibly similar to the present system, would be established after many years of recharge to the spoil from the adjacent undisturbed strata and from infiltration of precipitation. Accurate determination of the time necessary for aquifer reestablishment is beyond the current state of knowledge regarding postmining hydrologic systems.

Postmining ground water occurrence in the reclaimed coulees may help sustain the proposed vegetation and allow for at least a seasonal ground water table near the coulee surface. A primary determining factor would be the permeability of the underlying spoil. If the spoil is relatively permeable, spring runoff and snowmelt saturating the reclaimed coulee-bottom soils would be lost through downward percolation into the spoil. This may create seasonal drying of these soils. However, if the underlying spoil is relatively impermeable, or if Westmoreland compacts the coulee bottom spoil, percolation losses of this ground water could be minimized and the reclaimed coulee bottoms may at least seasonally contain a shallow ground water table.

Westmoreland's drainage bottom reclamation plan includes specific measures that would increase soil moisture in the coulee bottoms and therefore assist reestablishing vegetation. (See Vegetation.) These measures include steeper northeast facing slopes along the coulees to promote accumulation of drifting snow and to reduce excessive summer drying of the soils; placement of six feet of appropriate soil material in the incised coulee bottoms; and construction of a scoria infiltration blanket on terraces alongside coulee bottoms to promote infiltration. All these measures would serve to enhance soil moisture in reclaimed coulee bottoms.

Preliminary ground water quality data are available from four monitoring wells completed in spoil (Westmoreland Resources, 1983). These data indicate that spoil water quality is similar to ground water quality in undisturbed Robinson coal. Ground water in the spoil is predicted to have total dissolved solids concentrations range from 2,600 to 2,900 mg/l over time as more ground water resaturates the spoil.

The increased spoil TDS concentrations would have minimal, if any, impact on the East Fork of Sarpy Creek hydrologic system. There are two reasons for this: (1) spoil water TDS would exceed the East Fork of Sarpy Creek alluvial ground water TDS by only a small increment and (2) the rate of spoil ground water flow through the application area, if it ever approaches the current combined overburden, Rosebud-McKay, and Robinson ground water flow rates of 12 acre-feet per year, would be minor compared to the average flow rate of 102 acre-feet per year in the East Fork alluvium. Spoil water quality is not expected to affect deeper aquifers in the application area.

Three stock and domestic wells, numbers 303, 376 and 377, would be removed by mining in the application area. Stock and domestic wells located within the life-of-mine area that would be removed during mining are listed in table III-1. Stock and domestic wells located adjacent to the life-of-mine area (in which the water levels may be lowered as a result of local ground water level declines), are also listed in table III-1.

Westmoreland also proposes to use wells completed in strata underlying the Robinson coal as alternative water sources. Ground water from the sub-Robinson strata is commonly used in the Tract III area for domestic and stock supplies and would not be disturbed by mining.

Several wells have been completed in sub-Robinson strata by Westmoreland (Westmoreland Resources, 1983). Sustained yields and water quality of these wells are adequate alternatives for removed or potentially affected stock and

TABLE III-1

Stock and Domestic Wells Affected by Mining In the Life-of-Mine Plan

Wells Removed	Wells Possibly Affected
337A	327
303A	364
376A	365
377A	366
326A	373
372	317
360	375
337	306A
336	
335	
374A	
318A	
316	
315	
314	
298A	

Source: Westmoreland Resources, 1983.
Note: A = Abandoned Well
For the location of these wells, see fig. II-3.

domestic wells. Sub-Robinson wells could also be used to supplement the proposed impoundments as alternatives for the springs which would be removed by mining.

All three water sources, the existing springs, the proposed impoundments or sub-Robinson wells, would require perpetual maintenance to remain as viable surface water supplies in the future, whether or not mining occurs.

Mitigating Measures

To reduce water losses to percolation, Westmoreland could compact the spoil in the reclaimed coulee bottoms and underneath the proposed impoundments. Another alternative which could be implemented is for Westmoreland to not disc coulee bottom spoils prior to topsoil replacement.

SOILS

Summary of Impacts: The disturbance area contains excessive amounts of fine sandy loam soil. These soils are potentially erosive until vegetation is established.

Coulee bottom soils are often wet, and if salvaged when wet, would cause severe compaction and total deterioration of soil structure, which could adversely affect revegetation of coulee bottoms. Overall, impacts to soils would not be significant.

Soil Quantity and Quality

Westmoreland is proposing to salvage approximately 1,817.3 acre-feet of soil from the disturbance area, providing a total average cover depth of about 38 inches on the reclamation areas (table III-2). The company plans to direct haul (from freshly disturbed areas to reclamation areas) about 90 percent of its soils. This would minimize impacts on soil quality, especially the degradation that occurs when soils are stockpiled.

For the most part, the soils at the Absaloka Mine are chemically favorable. However, the Alice and Nelson soils, which make up about 65 percent of the application area (73 percent of the proposed salvage volume), are sandy. These sandy soils are potentially erosive because of their fine and very fine sand content and are more susceptible to drought because of their low water-holding capacities. The potential for rill and sheet erosion on these soils is greatest before vegetation establishment, although straw mulching (at a rate of 1 to 2 tons per acre) after seeding greatly reduces the erosion potential.

Soil Handling and Erosion

In its reclamation plan, the company plans to selectively salvage and replace specific soils in two cases. Scoria and sandstone soils that contain varying amounts of gravels and cobbles, and are unsuited for the reclamation of grassland areas, would be replaced where ponderosa pine or skunkbush sumac revegetation is planned. Such soils are similar to those now supporting these types of vegetation. Coulee bottom soils would be direct-hauled to recontoured drainage bottoms within the reclamation areas. Previously at the Absaloka Mine, this procedure has resulted in first-year emergence of important drainageway species such as rose and snowberry.

Gully erosion has been observed in one reclaimed coulee bottom at the Absaloka Mine. Gullies could be expected to develop in the application area during reclamation. If not repaired in the early stages of development, major soil losses could occur in these drainages. DSL would require the company to repair any gullies deeper than 9 inches (ARM 26.4.721). The potential for gully development would decrease after successful establishment of vegetation.

Rill and sheet erosion have also occurred in these drainage bottoms, but to a much lesser extent. This erosion could be somewhat mitigated by seeding the lowland drainage mixture immediately after soil replacement at one-third to one-fifth the normal rate. This low rate would also prevent excessive competition with the shrub seedlings. (See Mitigating Measures.)

According to its reclamation plan for drainages, Westmoreland would have a few sideslopes that are approximately 3:1 (33 percent) and 4:1 (25 percent).

TABLE III-2
Soil Resources to be Disturbed and Reclaimed in the Application Area

Soil Mapping Unit	Acres to be Disturbed	Percent of Total Area to be Disturbed	Proposed Total Salvageable Depth in Inches (topsoil/subsoil)	Estimated Salvage Volumes (acre-feet)			Percent of Total Salvageable Volume	Primary Limiting Factors
				Primary Lift (topsoil)	Secondary Lift (subsoil)	Total		
Alice Fine Sandy Loam, 4-15%	52	9	12/48	52.0	208.0	260.0	14.3	None
Aquolls and Aquents, 0-35%	11	2	12/48	11.0	44.0	55.0	3.0	Water Table
Cushman Loam, 4-8%	19	3	12/28	19.0	44.3	63.3	3.5	Bedrock
Fort Collins Loam, 2-4%	4	<1	12/48	4.0	16.0	20.0	1.1	None
Fort Collins Loam, 4-8%	24	4	12/48	24.0	96.0	120.0	6.6	None
McRae Loam, 4-8%	2	<1	6/54	1.0	9.0	10.0	0.5	None
Nelson Fine Sandy Loam, 2-15%	321	56	12/28	321.0	749.0	1,070.0	58.9	Bedrock
Spearman Loam, 4-8%	5	<1	6/30	2.5	12.5	15.0	0.8	Bedrock
Thedalund Loam, 4-8%	1	<1	6/14	0.5	1.2	1.7	0.1	Bedrock
Thedalund Loam, 8-25%	74	13	6/14	37.0	86.3	123.3	6.8	Bedrock
Thedalund-Wibaux Complex, 8-15%								
Thedalund part	42	8	6/14	21.0	49.0	70.0	3.9	Bedrock
Wibaux part	18	3	6/0	9.0	0.0	9.0	0.5	Bedrock
TOTALS	573	100		502.0	1,315.3	1,817.3	100.0	

Source: Westmoreland Resources Inc., bk. D, vol. 5, 1982.
Note: Percentage figures following mapping unit names represent slope ranges where unit is found.

It is likely that these proposed slopes would be covered after mining with significant amounts of fine sandy soils. Although the sandy soils are labeled as "fine sandy loams," their very-fine and fine sand content, which is directly related to erodibility, is unknown. Without additional mitigating measures, these sideslopes could have erosion problems until vegetation becomes well established. However, Westmoreland also plans to place scoria-derived soils, high in coarse fragments, on parts of these sideslopes. The coarse fragments would decrease the erosion hazard by intercepting runoff water.

A soils problem could arise in the coulee bottoms. As discussed earlier, Westmoreland would salvage the coulee bottom soils and replace them directly in reconstructed coulee bottoms in the reclamation areas. The coulee bottom soil type, labeled "Aquolls and Aquents," has a water table in some places that varies within 5 feet of the surface. Attempts to salvage wet soils, regardless of the equipment used, would lead to severe compaction and complete deterioration of soil structure. Draining these areas and allowing them to dry for a period of time appears to be the only way to reduce soil compaction and degradation. (See Mitigating Measures.)

Mitigating Measures

Westmoreland could reduce the erosiveness of the reclaimed soils by decreasing the amount of sandy soils proposed for salvage. (Refer to table III-2.) The Alice soil could be decreased from a total salvage depth of 60 inches to 48 inches. Similarly, the Nelson soil could be decreased from a total salvage depth of 40 inches to 24 inches. The Fort Collins soil is more favorable, owing to heavier texture, and its salvage depth could be increased from 60 inches to 84 inches. These salvage depth adjustments would still allow for an overall salvage and replacement depth of greater than 2 feet.

Careful monitoring of rill and sheet erosion and gully development in the drainages would allow Westmoreland to take effective remedial action to prevent excessive soil losses. Rill and sheet erosion could be somewhat mitigated by seeding the lowland drainage mixture immediately after soil replacement at one-third to one-fifth the normal rate. This low rate would prevent excessive competition with the shrub seedlings.

The company could drain the coulee bottom soils and allow them to dry by digging a trench downstream of the coulee several weeks or months before soil salvage.

VEGETATION

> Summary of Impacts: Mining of the application area would destroy 573 acres of vegetation over 13 years. After revegetation, grasslands would cover 74 percent of the disturbance area compared to 35 percent at present. This

would increase livestock forage production, although plant species diversity would decline. Agricultural land (cropland) and the closed canopy ponderosa pine forest would be eliminated. The amount of deciduous shrubs, trees, and vegetation beside ponds would decline substantially. Reestablishment of the open-canopy pine forest would probably succeed.

Revegetation would begin within 2 years after the initiation of each mining pass. Topsoil, mostly replaced by the direct haul method, would be plowed, seeded, and mulched. Westmoreland may need to modify soil replacement plans to reduce potential erosion. (See Soils.) Revegetation would increase the proportion of grassland on the application area from 35 percent at present to 74 percent after reclamation (table III-3). Agricultural lands would not be replaced. Amounts of deciduous trees, shrubs, and vegetation beside ponds would be substantially reduced (Westmoreland Resources, 1983, bk. H). In addition, the intricate premine mosaic of vegetation types would be greatly simplified. No threatened or endangered plants would be affected.

TABLE III-3

Disturbance Area Acreages of Premining and Postmining Vegetation Types

Premining Type	Acres	Postmining Type[1]	Acres
Grassland[2]	202	Grassland	422
Ponderosa Pine Forest	184	Ponderosa Pine	137
Deciduous Tree/Shrub and Riparian	28	Drainage and Aquatic	14
Agricultural		--[3]	
Small grains	66	--	0
Alfalfa Hay	88	--	0
Miscellaneous Disturbance	5	--[3]	0
TOTAL	573		573

Source: Westmoreland, 1983 (bk. H, ex. 7, p. 2; bk. H, ex. 9, pl. 1).

[1]The difference between some premining and postmining type names reflects the different classification schemes used by Westmoreland Resources.

[2]Includes disturbed grassland subtype.

[3]Agricultural and miscellaneous disturbance acreages would be converted during revegetation to other types.

Grassland

With more grassland after mining, more total livestock forage would be produced. Postmining forage production would be raised further by the expected increase in productivity after reclamation. Short-term productivity of reclaimed grassland is generally higher than productivity of native grassland (Hofmann and Ries, 1980; Sindelar 1980). Factors contributing to this higher productivity include reduced plant competition, high productivity of species in seeding mixtures, generally increased availability of nutrients due to soil disturbance, and the comparatively poor condition of heavily grazed native rangeland. Productivity of reclaimed grassland probably declines over the long-term. Still, assuming proper range management and favorable climatic conditions, postmining productivity is expected to remain above premining levels.

The diversity of grassland plants after reclamation would be lower than the diversity at present. This is due to two effects: (1) cool-season species (species exhibiting maximum growth in spring and fall) reestablish more successfully than warm-season species (species exhibiting maximum growth in summer) and (2) most soil microsites would be lost during soil replacement. The proposed use of direct haul topsoiling and, in upland areas, a warm-season-species-dominated seeding mixture would partially compensate for the above effects. (See app. E.) Over the long term, invasion by nearby native plants would probably increase diversity to near premining levels.

Ponderosa Pine

Revegetation of the open-canopy ponderosa pine subtype would probably succeed. Westmoreland proposes to plant 500 seedlings per acre during reclamation. With a 4-year mortality rate for containerized seedlings of about 40 percent (Amendola et al., 1984), up to three-fourths of the seedlings could die and, after 4 years, the premining density would still be reached. Other studies (Hite, 1974; Orr 1977) indicate that allowing for 40-50 percent mortality is appropriate.

In the closed-canopy subtype, by contrast, the premining density of ponderosa pines would not be reached with proposed planting rates. This subtype would probably be eliminated. The long-term density of the trees in the closed-canopy type would be increased by volunteer ponderosa pines and seeds from planted pines. However, undisturbed ponderosa pine are not close enough to serve as significant seed sources. Moreover, natural seeding from planted pines would take several decades, assuming the seedlings survive until maturity and sites are favorable for seed germination and subsequent growth.

Drainage Bottoms

After reconstruction of drainages, channel bottoms would be surfaced with soil hauled directly from undisturbed drainage bottoms. Those areas not proposed for shrub and tree plantings would be seeded with the lowland grassland seed mixture and several sod-forming grasses (app. E). The direct-hauled soil would provide a source for snowberry and rose regeneration. Westmoreland's

test plots indicate a good probability of shrub establishment with the direct-hauled topsoil.

After spreading topsoil and straw mulch, the company would plant shrub and tree seedlings, primarily plum and chokecherry, at a rate of 1,000 per acre (see app. F for proposed species). Research at the Absaloka Mine has shown almost complete survival of plum, chokecherry, and currant after one growing season (Amendola et al., 1984). Jensen and Hodder (1979) found plum and chokecherry to be vigorous, spreading species with high (over 80 percent) 4-year survival rates. Much lower (40 percent) 5-year survival rates of plum were reported by Bjugstad et al. (1981).

The documented establishment of shrubs and trees on reclaimed land indicates that drainage revegetation has a reasonable probability of success. Moisture-conserving features of reconstructed drainages (See Hydrology, Ground Water) would further promote shrub and tree growth.

A major obstacle to revegetation success could be a dry year during seedling planting. Most woody species become established only during average to above average precipitation years (Bjugstad, 1984a). Use of straw mulch, which usually contains weed and/or cereal grain seeds, also poses potential problems. Sprouting weeds and cereal grain plants, strong competitors for water, would reduce the amount of moisture available for seedlings (Kay, 1980; I.B. Jensen, Western Reclamation, personal commun., February 2, 1984). Straw mulches also attract small rodents that can damage seedlings (Stoeckeler and Slabaugh, 1965). Unpredictable factors which would limit success are excessive erosion of channel bottoms, soil compaction and breakdown, and destruction of developing plants by wildlife or livestock.

Aquatic Vegetation

Westmoreland projects 7.5 acres of aquatic vegetation to become naturally established in or around reconstructed ponds in the northeast corner of the disturbance area. Plans call for supplemental planting of cattail, bulrush, and sedges "if necessary."

Proposed acreages of aquatic vegetation would not be attained. During a mean runoff year (Westmoreland Resources, 1983, bk. I), the reconstructed ponds would cover an estimated maximum of 3.7 acres. Pond water would increase surrounding soil moisture and associated vegetation for only several feet. Cattail and bulrush both require moist mudflats or shallow water for seedling development (George, 1963; Yeo, 1964; Linde et al, 1976). Roughly 3.8 acres would therefore be exposed to erosion or weed invasion. At best, species from adjacent revegetated grasslands would grow on this acreage. Also, although the area would not be used for grazing during the first 3 years after reclamation, cattle use may damage developing plants (Berg, 1956; Evans and Kerbs, 1977).

Life-of-Mine Area

Reclamation plans have not been developed for the life-of-mine area. Revegetation techniques used in the application area could be extended to the life-of-mine area. Similar results would be expected.

Mitigating Measures

- The proposed upland grassland seed mixture contains 60 percent warm-season grasses (app. E). Despite the high percentage, the highly competitive cool-season grasses in the mix (20 percent) may still dominate during revegetation. To promote diversity, Westmoreland could increase the proportion of warm season grass in the mix. In addition, where possible, favorable microsites could be identified and seeded with warm-season grasses.

- At the proposed ponderosa pine planting rate (500 per acre), Westmoreland would not restore closed-canopy ponderosa pine stands. To increase the density of some postmining stands, the company could increase the pine planting rate in small areas.

- To increase the survival rate of seedlings, the company could use containerized ponderosa pine and chokecherry seedlings wherever possible. Experience at the Absaloka Mine shows that bare-root stock has less than one-third the survival rate of containerized ponderosa pine seedlings (Amendola et al., 1984). Hite (1974) and Orr (1977) also report higher survival of containerized stock. Containerized chokecherry also survives better than bare-root stock (Jensen and Hodder, 1979).

- To improve revegetation success, ponderosa pine and shrub seedlings could be monitored for damage by wildlife or livestock. Protective measures (such as chemical repellents or fencing) and/or replanting may be required.

- To improve reestablishment of drainage bottom vegetation, drainages could be monitored for excessive erosion, and remedial measures taken where necessary. Suggested measures include sodding, planting additional shrubs, regrading, and retopsoiling.

- To reduce introduction of undesirable plants in deciduous shrubs and tree planting areas, Westmoreland could use the "cleanest" straw mulch available (least amount of weed and cereal grain seeds). The company could also consider alternative mulches such as clean native range hay, gravel, and wood fiber with a chemical tackifier. Use of these mulches would decrease or eliminate introduction of competitive plants and would not attract rodents.

- Introduced and/or invading plants may inhibit deciduous shrub and tree growth. Weeds could be reduced by applying a short-term soil sterilant or scalping (removing a small area of vegetation around each plant) during planting. Hoeing could also be used periodically during the first growing season.

- If below average precipitation occurs within the first few years after shrub and tree planting, watering could be used to increase survival. Irrigation substantially increased survival of plum, buffaloberry, and green ash in Wyoming studies (Bjugstad et al., 1981). Westmoreland could use reestablished wells to supply a trickle irrigation system patterned after Bjugstad (1984b) or Garcia (1979).

  Shrubs and trees could also be watered during planting. This would settle soil and reduce air pockets, increasing survival (J. Coenenberg, Western Energy Co., personal commun., February 6, 1984).

- Westmoreland could extend drainage bottom grasses (app. E) into areas where proposed aquatic vegetation would not grow. Sedge species adapted to wet sites could be added to the seed mixture. Cattail seeds, collected from local sources, could be broadcast around reconstructed ponds. This would supplement natural invasion (A. Bjugstad, U.S. Forest Service, personal commun., February 23, 1984).

- Grassland seed mixtures include 1 percent shrub seeds (app. E). Establishment and survival of shrubs could be monitored and seeding rates adjusted accordingly.

AQUATIC ECOLOGY

Summary of Impacts: Aquatic habitat and associated organisms would be substantially reduced in the North Coulee's drainage area. This impact would be significant in the application area. However, this reduction would not be regionally significant. No threatened or endangered species exist in the North Coulee.

In two-thirds of the North Coulee's drainage area, mining would eliminate aquatic habitat and associated organisms. After reclamation, macroinvertebrates would repopulate the proposed impoundments. The change in the number of the water sources (see Hydrology) would probably reduce the numbers and kinds of aquatic invertebrates. The result would be a reduction in food organisms for certain vertebrate species, such as song birds, in the application area.

The most abundant organisms after mining, like today, would probably be the highly mobile (Hemiptera, Odonata and Coleoptera) and short-lived (Dipteran) organisms that prefer standing water. Organisms such as *Simulium* sp., *Diamesa* sp. (Diptera), and *Hydropsyche* sp. (Trichoptera), which prefer moving water habitats, would probably be eliminated, owing to the cessation of spring flows.

Over the long term, impacts could increase. Filling of the impoundments by sedimentation would eventually eliminate aquatic life altogether from the application area unless the ponds are maintained by the postmining landowner.

The impacts in the application area would not affect other nearby life systems. Removal of additional springs in the life-of-mine area would further reduce aquatic habitat and associated organisms, but, similarly, impacts would not be significant overall.

The aquatic ecology of the East Fork of Sarpy Creek would not be affected by the proposed plan. The effect on the creek in the life-of-mine plan, in which increases in total suspended sediment may occur, cannot be determined.

Mitigating Measures

To increase aquatic habitat after mining, the company could establish overflow ponds supplied by water from wells.

WILDLIFE

Summary of Impacts: Mining in the application area would temporarily force wildlife from, and destroy, 573 acres of habitats, including one great-horned owl nest. After mining, reclaimed lands would supply foraging areas for deer, turkeys, and sharp-tailed grouse. However, the change in water sources (with associated vegetation) and the decreased acreage of woody cover would lower habitat quality for deer, turkeys, grouse, waterfowl, and several nongame species. Also, decades would be required for reestablished ponderosa pines to supply adequate cover. Although mining would have significant impacts on many wildlife species on the application area, regional effects would be negligible.

Impacts in the Application Area

Wildlife Habitat

Vegetation: Mining would destroy over a 13-year period 573 acres of existing wildlife habitats, mostly grassland, ponderosa pine, and agricultural types (table II-6). A small amount of the silver sagebrush type would also be destroyed, as would coulee bottom types which are important to wildlife. Reclamation of wildlife habitats (Westmoreland Resources, 1983, bk. G, vol. 3) would begin within 2 years after the initiation of each mining pass.

Postmining reclamation would more than double the amount of grassland on the proposed disturbance area. Alfalfa and wheat fields would be eliminated. Proportions of other premining habitat types would be reduced and the mosaic

of wildlife habitats would be simplified. Vegetation associated with surface water would be decreased. Wildlife would find little cover in reclaimed pine forests until trees attain sufficient size, decades after planting. Cover would be further reduced if drainage bottom revegetation plans do not succeed. (See Vegetation.)

Water Sources: Mining would remove five water sources used by wildlife and interrupt flow to another offsite source. Three of these sources are considered perennial. (See chapter II, Hydrology). Proposals to provide water after mining require a commitment to long-term maintenance and contain unknown factors (table III-4). During most years, one seasonal pond, one seasonal

TABLE III-4

Water Sources for Wildlife After Mining And Reclamation of the Application Area

Source	Water Availability	Comments	EIS Reference
Reconstructed pond	Seasonal (spring)	Regular, long-term maintenance required	Hydrology (Surface Water)
Reconstructed pond	Perennial (90% probability)	Regular, long-term maintenance required	Hydrology (Surface Water)
Well No. 1[1]	May-July	Pumping required; long-term operation unknown	Hydrology (Groundwater) Land Use (Grazing)
Well No. 2[1]	August-October	Pumping required; long-term operation unknown	Hydrology (Groundwater) Land Use (Grazing)
Spring[2]	Seasonal	Would appear below reconstructed seasonal pond, excavation necessary	Hydrology (Surface Water and Ground Water)
Offsite pond[3]	Perennial	Would recover after mining; flow decreased	Hydrology (Surface Water and Ground Water)

[1] Assumes that water would be pumped at only one location during each half of the grazing season.

[2] Known as spring 5 prior to disturbance. Due to low premining flow (table II-2), disturbance would probably result in loss of its perennial nature.

[3] Associated with spring 12 which would cease flowing during mining.

spring (No. 5), one perennial pond, and one well with a stock tank (May-October only) would supply water for wildlife. Negative impacts on wildlife would be exacerbated during years when the proposed perennial pond dries up. (See Hydrology.) The recovery of the offsite pond would supply another nearby perennial water source although decreased flow would reduce aquatic and shoreline habitat.

Big Game

Mule Deer: Based on 1981 observations, the disturbance area cannot be considered mule deer winter range. However, the area contains a substantial amount (384 acres) of ponderosa pine and grassland habitat types, which are often used by wintering deer. The area also provides mule deer range and habitats during all other seasons. Mining would gradually force deer into surrounding suitable habitats.

Mule deer may return to reclaimed grassland habitat types as early as 2 years after mining. The reclaimed lands would provide attractive winter and spring foraging areas and may be especially important for forage during severe winters. In the long term, the quality of reclaimed grasslands would remain high, assuming proper livestock management.

Complete reclamation of coulee bottoms and ponderosa pine forests would take decades. During this period, the reduced thermal, escape, and reproductive cover would decrease the overall quality of deer habitat. Small areas of dense coniferous cover are an important component of winter thermal cover (Thomas et al., 1979). The elimination of the closed-canopy ponderosa pine subtype (see Vegetation) would reduce winter thermal cover.

The simplified mosaic proposed for the postmining area and the change in water sources and agricultural lands would provide lower quality deer habitat than before mining. Since deer use a variety of habitat types, the postmining arrangement would force deer to range farther to satisfy their needs.

Human disturbance of mule deer on reclaimed land would be minimal. As long as Westmoreland controls the surface, the prohibition of firearms and hunting may create a refuge that attracts deer during hunting season.

The overall effects on mule deer from temporary habitat destruction, displacement from the application area to nearby lands, and deterioration of habitats after mining would probably be small. However, the effects cannot be predicted accurately for the Tract III area. Regionally, mining would not affect mule deer populations.

White-tailed Deer: The effects of mining and reclamation on the small white-tailed deer population would be somewhat more severe than those effects on mule deer. Whitetails are more dependent on agricultural land for winter forage and shrub thickets for cover. Eliminating agricultural lands would force deer to travel farther for forage. Reducing dense woody cover would probably decrease foraging in adjacent reclaimed grasslands. However, successful shrub growth in coulee bottoms would assure some use of reclaimed lands.

Pronghorn: Pronghorn are rarely observed on the disturbance area. Mining's effect on the species would therefore be insignificant. In fact, increasing the amount of grassland in the disturbance area may improve habitat quality for pronghorn. Westmoreland's fences would allow for passage of pronghorn.

Other Mammals

Mining would have little effect on predator populations. Coyotes and badgers would find reclaimed grassland suitable for hunting. Other predators (bobcats, raccoons, weasels, skunks) that are more dependent on dense, woody vegetation would use reclaimed areas infrequently until planted trees and shrubs grow big enough to provide cover. Similarly, desert cottontails, porcupines, least chipmunks, and red squirrels that also depend on woody cover would also use the newly reclaimed areas less frequently.

Small mammal populations would be eliminated or displaced during mining. However, the dense; herbaceous cover of reclaimed grasslands would provide good habitat. Deer mouse, prairie vole, and other small mammal populations would recover within a few years after reclamation begins.

Upland Game Birds

Meriam's wild turkeys would probably return to feed in reclaimed grassland. However, the elimination of agricultural land, used for foraging, would reduce habitat quality. Acreage of dense, woody cover in drainages would be reduced. Several decades would be required to replace roosting habitats eliminated by mining. Ponderosa pine must grow to 40 feet or more to supply roosting sites (Boeker and Scott, 1969).

After mining, the loss of woody cover would reduce the quality of sharp-tailed grouse habitat. Trees and shrubs provide important cover for Montana sharptails (Ecological Consulting Service 1976a, 1976b; Bjugstad, 1976). In the short term, loss of woody cover would be partially compensated for by the dense, herbaceous cover and abundant forage of reclaimed grasslands. Adequate cover would eventually return as trees and shrubs mature. However, the acreage of woody cover would be permanently reduced.

Waterfowl

<u>Decreased</u> vegetation around ponds would <u>limit</u> the potential for waterfowl production. Most waterfowl require dense emergent and/or shoreline vegetation for nesting and brooding (Anderson and Glover, 1967; Evans and Kerbs, 1977). Waterfowl, however, would use reconstructed ponds <u>and the offsite pond</u> as resting areas.

Raptors (Birds of Prey)

Raptor hunting habitat may be slightly reduced during mining. Reclamation and the anticipated repopulation of the mined area by small mammals that serve as

prey would make the effect temporary. Planted ponderosa pine would not be tall enough to serve as eagle or hawk nest sites for several decades. Proposed powerlines would be designed to prevent raptor electrocution.

Mining would destroy a great horned owl nest and may cause desertion of a nearby red-tailed hawk nest. Redtails, especially early in their reproductive cycle, may not tolerate disturbances near their nests (Jackman and Scott, 1975).

Songbirds

Grassland songbirds, such as meadowlarks and vesper sparrows, would be more abundant than forest species on the disturbance area for decades after reclamation. Planted pines would have to grow to sufficient size and density before birds such as red crossbills and black-capped chickadees would repopulate the area. Vegetation associated with perennial water, important habitat for solitary vireos, yellow warblers, rufous-sided towhees, and other songbirds, would be greatly reduced.

Reptiles and Amphibians

The dense herbaceous vegetation and small mammal prey base of reclaimed land would meet most habitat requirements of snakes. Rattlesnake use, however, may be limited by a lack of rocky cover. Although reconstructed ponds and the offsite pond would supply habitat for turtles and amphibians, short-term repopulation is unlikely due to the distance to undisturbed ponds. Nearby, offsite populations are usually necessary for repopulation (Pentecost and Stupka, 1979).

Threatened and Endangered Species

OSM prepared a biological assessment of the potential impacts of proposed mining on the peregrine falcon, the bald eagle, and the black-footed ferret (appendix H). OSM concluded that the proposed action would not affect the peregrine falcon and the bald eagle, and the U.S. Fish and Wildlife Service has concurred with this conclusion (appendix H). Westmoreland would report future observations of threatened and endangered species to the Department of State Lands.

With regard to the black-footed ferret, OSM and the U.S. Fish and Wildlife Service agreed that additional surveys would be necessary in the prairie dog town in the life-of-mine area (appendix H). Such surveys must be conducted within one year before disturbance, using methodology approved by the Fish and Wildlife Service. Survey results would have to be submitted to and approved by OSM and the Fish and Wildlife Service before mining proceeded.

Life-of-Mine Impacts

Mining would remove about 2,096 acres of wildlife habitats in the life-of-mine area. Over half of these acres are in the grassland habitat type (table II-6). Six water sources and nine rock outcrops would be mined through, generally lowering wildlife habitat quality.

Mining would gradually force big game animals from the life-of-mine area. Relatively large amounts of habitat types used by deer and pronghorn would be destroyed. Reclamation plans have not been developed. Thus, long-term and regional effects on big game populations cannot be predicted.

Bird habitat would also be disturbed by mining. Ring-necked pheasant habitat along the East Coulee and three sharp-tailed grouse dancing grounds would be destroyed. One great horned owl nest and one red-tailed hawk nest would be removed. Mining would advance to within 0.25 mile of a red-tailed hawk nest and a northern harrier nest, creating a potential for nest desertion.

Mitigating Measures

Westmoreland could improve overall habitat quality for wildlife by planting more acres of ponderosa pine and deciduous shrubs. Replacing the original acreages of deciduous shrubby/riparian vegetation and of ponderosa pine forest may be the best approach. This would create conditions similar to those of optimum mule deer habitat (60 percent open, foraging area; 40 percent cover) suggested by Thomas et al (1979). Several other wildlife species would also respond favorably.

To improve the quality of thermal cover for wintering mule deer, Westmoreland could increase the ponderosa pine planting rate in several 2- to 5-acre areas. Thomas et al. (1979) describe optimum mule deer thermal cover.

Westmoreland could establish rock and brush piles to increase postmining cover for reptiles and rabbits.

To provide potential nesting and perching sites for birds, several snags (dead trees) could be erected on reclaimed lands.

For improving sharp-tailed grouse habitat, Westmoreland could try to create new dancing grounds. Techniques described by Ecological Consulting Service (1976) could be used.

Transplanting could be used to repopulate affected areas with turtles and amphibians.

Westmoreland could improve proposed stock tanks for wildlife by adding overflow ponds, floating platforms, and escape ramps. If necessary, cattle use could be regulated at stock tanks, overflow ponds, and reconstructed ponds. If both reconstructed ponds go dry (table III-4), wells at both stock tanks could be pumped. The company could increase wildlife use of reclaimed areas by keeping tanks full from March through November. (Pumping is now proposed for May through October. See Land Use.)

CLIMATE

Continued mining at the Absaloka Mine would not affect the climate. Particulate emmissions would remain at or near ground level, and total emissions would be too small to affect either precipitation or radiation balance.

TABLE III-5
Particulate Emissions

Source	Extent	Emission Factor	Emissions (tons/year)	Control Strategy	Percent Control	Controlled Emissions (tons/year)
Topsoil Removal	532,400 yd^3	0.38 lb/yd^3 [a]	101	-		101
Overburden Removal	41 x 10^6 yd^3	0.03 lb/yd^3 [a]	615	-		615
Coal Removal	11 x 10^6 tons	.002 lb/ton[a]	11.6	-		11.6
Overburden Drilling	20,800 holes	1.5 lb/hole[a]	15.6	water injection	90	1.6
Coal Drilling	20,800 holes	0.22 lb/hole[a]	2.3	water injection	90	0.2
Overburden Blasting	520 blasts	37.5 lb/blast[a]	9.8	-		9.8
Coal Blasting	520 blasts	26.25 lb/blast[a]	6.8	-		6.8
Traffic Haul Roads	460,000 miles	6.8 lb/vmt[b]	1564	dust suppressent	85	235
Truck Dump	11 x 10^6 tons	.013 lb/ton[a]	71.5	-		71.5
Crushing						
Primary	11 x 10^6 tons	.02 lb/ton[a]	110	enclosed	99	1.1
Secondary	11 x 10^6 tons	.06 lb/ton[a]	330	enclosed	99	3.3
Conveyors	11 x 10^6 tons	0.2 lb/ton[a]	1100	partially covered	90	110
Coal Storage	1.6 ac 2.6 m/sec	0.9 u lb/acre hr[a]	16.4	enclosed	99	0.2
Train Loading	11 x 10^6 tons	.0002 lb/ton[a]	1.1	retractable shut	50	0.6
Exposed Area	330 acres	1200 lb/acre[b]	198	-		198
Access Road Traffic	62,800 miles	4.4 lb/vmt[b]	138	dust suppressent	85	20.7
Haul Road Repair	16,640 hours	16 lb/hr[a]	133	-		133
TOTAL						1,519

Note: vmt = vehicle miles traveled; u = wind speed

[a] written commun., Pat Driscoll, Montana Air Quality Bureau
[b] Department of State Lands, 1979, p. III-9

AIR QUALITY

Summary of Impacts: During maximum production, mining would cause significant impacts on present air quality. Total suspended particulate (TSP) concentrations would increase, especially close to mining and the processing facilities. But the Montana and Federal Ambient Air Quality Standards would not be exceeded.

TSP would be the only pollutant of major concern emitted by mining. Most TSP would be noncoal dust from (1) overburden and topsoil removal and (2) haul road traffic and repair. These activities would produce more than 70 percent of the 1,519 tons of particulate emitted annually. Wind erosion of exposed areas would also produce a large amount of particulate: 198 tons, or 13 percent of the total, per year (table III-5).

The coal processing facility would emit small quantities of coal dust. The dumping, crushing, conveying, and loading of coal would produce about 187 tons of coal dust per year, about 12 percent of total particulate emissions.

The particulate emitted by the mine would consist of large particles that fall to the ground close to the source. TSP concentrations would therefore decrease rapidly with increased distance from the mine. Overall, at the mine, TSP concentrations are expected to increase over present levels (see chap. II, Air Quality), but the concentrations would still be well below all applicable standards.

Emissions expected from the Absaloka Mine would be similar to other large open pit operations. For comparison, during 1980 and 1981 the Decker mining complex in southeastern Montana recorded a maximum annual geometric mean TSP concentration of about 37 $\mu g/m^3$. Coal production during the 1980-81 period equaled the maximum production projected for the Abasloka Mine (10 million tons per year). Westmoreland must use dust control practices similar to those used by the Decker complex, according to the air quality permit (1418) approved by the Montana Air Quality Bureau on June 11, 1980. Therefore, the TSP concentrations resulting from the Westmoreland operation are expected to be similar to the levels at the Decker complex.

Internal combustion engines, diesel and gasoline, would emit 445 tons of nitrogen oxides, 103 tons of carbon monoxide, 35 tons of sulfur oxides, 34 tons of hydrocarbons, and 22 tons of particulate annually. The air quality would not be measurably affected by these emissions.

ECONOMICS

Summary of Impacts: Impacts to the local economy would not be significant. Any new mine jobs resulting from

increased coal production are likely to go predominately to Crow Indian workers. At maximum, 140 more jobs would be created at the mine. In the county, total employment is projected to continue to grow at current, modest rates through the life-of-mine period. At full production, the mine's payroll would increase from $4.1 million to $8.7 million per year.

Employment

The mine today employs 125 workers. Under Westmoreland's application, employment would rise by 1984 to 155 workers, enough to operate the mine at the 5-million-ton-per-year production level. In the life-of-mine plan, the company would employ a maximum of 265 workers, the number needed for the full production level of 10 million tons per year. Most new employees are expected to be members of the Crow Tribe (David W. Simpson, Westmoreland Resources Inc., written commun., November 19, 1982). The increases in employment, if they occur as assumed by Westmoreland, would lead the projected economic recovery in the county in 1984.

The mine, together with other economic factors, would steadily increase Big Horn County employment in the years ahead. Exact projections of employment, however, require several assumptions. The first is that existing trends in most basic industries continue. Another is that full production would be reached at the Absaloka by 1997 and the Decker area mines by the late 1980s. Under these assumptions, employment in agriculture is projected to fall slightly through 2015, reflecting a small drop in the number of agricultural proprietors. Meanwhile, steady growth in the other basic industries, particularly government employment associated with the reservations, would gradually erode agriculture's dominance as the county's economic base.

Total employment is projected to grow from its low of 4,430 jobs in 1984 to 4,893 jobs in 1990, an increase of 10 percent (Mountain West Research-North Inc. [MWR-N], 1983, p. 4-55). In both the 1990s and in the first decade of the twenty-first century, total employment is projected to increase by 14 percent, followed by a 7 percent increase between 2010 and 2015, reaching 6,834 jobs in 2015 (MWR-N, 1983, p. 4-55). (For additional detail on employment, see the 1983 report by Mountain West Research-North.)

Income

Projections of personal income follow the same pattern as employment projections. The 1 percent employment decline between 1980 and 1984 would produce about a 3 percent decline in total personal income. Because the population would continue to grow over the period, per capita income would decline even more, by about 6 percent (MWR-N, 1983, p. 4-56).

The growth in employment that is assumed to occur after 1984 would increase total personal income. From its 1984 low, total personal income would climb by 12 percent by 1990. During the 1990s, it would grow by 15 percent, and between 2000 and 2015, by 22 percent (MWR-N, 1983, p. 4-56).

Population increases would partially offset this total income growth: Per capita income would rise, but not enough to reach the 1980 level until about halfway through the 1990s (MWR-N, 1983, pp. 4-53 and 4-56). This rise in per capita income would steadily continue at about 0.1 percent per year, through 2015, and per capita income would be about 11 percent higher in 2015 than at the 1984 low point.

Mining would add millions to tribal revenues through royalties. At currently negotiated rates, the mine would pay as much as $5.7 million to the tribe in a single year and $45 million overall during the life of the proposed permit. In the life-of-mine plan the amount paid to the tribe would rise to as much as $71 million per year and $308 million overall. (For additional detail on income, see the 1983 report by Mountain West Research-North.)

SOCIAL CONDITIONS

Summary of Impacts: The continued operation of the Absaloka Mine would not cause significant impacts to the social organization, population, or housing of Big Horn County, the Crow Reservation, or the Northern Cheyenne Reservation.

Big Horn County

Social Organization

The Absaloka Mine's continued operation, at present or increased employment levels, would have no effect on social organization in Big Horn County. The mine's operation would allow the continuation of some recent social developments, such as ties of local government, business, and individuals with outside agencies and people. The operation would also allow continued occupational diversity and encourage local governments to sustain planning and coordination efforts, internally and with outsiders (MWR-N, 1983). The mine's operation would also have little effect on the Crow Tribe's social organization (The Crow Tribe of Indians and American Indian Technical Services, 1983).

Population

In the future, Big Horn County's population is expected to increase moderately, rising 11.5 percent above the 1980 level by 1990, 22.9 percent by 2000, 36.5 percent by 2010, and 46.5 percent by 2015 (fig. III-1 and table III-6). These projections assume that the future holds no major new development, that is, existing mines operate according to their mine plans.

None of the nonreservation areas' population is projected to increase as rapidly as the county population as a whole. Hardin would grow faster than the other two subcounty areas (table III-6), but by the year 2015 the town's 37.1 percent population increase would be 9.4 percent below the countywide

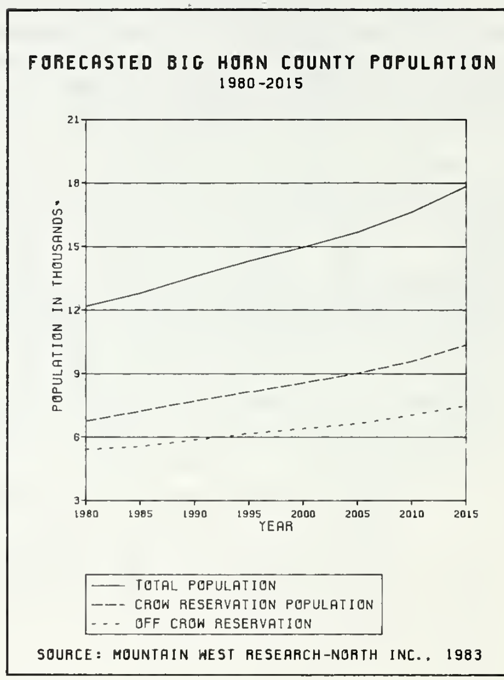


FIGURE III-1

Big Horn County's population is projected to grow 17.5 percent from its 1980 level by 1995 and 46.5 percent by 2015. The Crow and Northern Cheyenne Reservation populations are expected to grow faster than the populations off the reservations.

increase. Over the same period, the county's northern area is expected to increase only 18.5 percent and the Decker area only 5.9 percent. The larger countywide increases show that the population on the county's reservations is likely to increase faster than in nonreservation areas.

Table III-7 shows the portion of the population resulting from the Absaloka Mine. (Population "resulting from the mine" means <u>those</u> employees, their families, and <u>other people</u> supported, directly or indirectly, by the mine <u>who have moved to or will migrate into the county.)</u>

Most of the miners to be hired at the Absaloka Mine would be Crow Indians who are current county residents. Hence, only about half of the county's population associated in some way with the mine would probably be people moving into the county. Those moving into the county are most likely to be non-Indians who will live off the reservation.

Housing

By 1990, the county is expected to need nearly 17 percent more housing than in 1980 (fig. III-2 and app. D, table D-5). This figure is expected to increase to over 36 percent by 2000 and over 64 percent by 2015.

Housing demand patterns in the nonreservation areas in the county would resemble population increases in those areas. None of the three jurisdictions have demands as high as the county as a whole. Hardin would probably need more housing than the other two areas, and the Decker area would probably need

TABLE III-6

Forecast of Big Horn County Population

Year	Big Horn County[1]	City of Hardin	Big Horn County North (excluding city)	Decker Area
1980	12,180	3,215	978	205
1981	12,325	3,242	977	207
1982	12,421	3,245	969	203
1983	12,536	3,256	962	196
1984	12,655	3,270	958	197
1985	12,797	3,300	956	197
1986	12,931	3,326	955	197
1987	13,064	3,345	954	197
1988	13,187	3,362	953	196
1989	13,308	3,379	950	196
1990	13,585	3,481	978	203
1995	14,308	3,665	1,005	206
2000	14,966	3,797	1,016	204
2005	15,673	3,940	1,050	197
2010	16,628	4,160	1,106	207
2015	17,843	4,407	1,159	217

Source: Mountain West Research-North, Inc., 1983.
[1] Adjusted for Indian undercount in 1980 census.

the least. The bulk of housing increases would be on the reservations. Very little of the housing demand would stem from the Absaloka Mine.

Crow Reservation

Population

The reservation's Indian population is expected to increase rapidly, regardless of Westmoreland's operation. The reservation's population is projected to rise by 22 percent from 1980 to 1990, 38 percent by 2000, and 69 percent by 2015 (fig. III-3 and app. D, table D-6). In contrast, the non-Indian reservation population is not expected to increase until after 2000, and then by only 14 percent by 2015 (fig. III-4 and app. D, table D-7). None of the population increase on the reservation would result from the Absaloka Mine's operation.

TABLE III-7

Forecast of Big Horn County's
Population Increase Resulting from the Absaloka Mine

Year	Total Forecasted Population	Number* From Absaloka Mine	Percent of Big Horn County Population
1983	12,536	250	2.0
1984	12,655	240	2.0
1985	12,797	240	1.8
1986	12,931	240	1.8
1987	13,064	290	2.2
1988	13,187	380	2.8
1989	13,308	380	2.8
1990	13,585	460	3.4
1995	14,308	530	3.8
2000	14,966	530	3.6
2005	15,673	530	3.4
2010	16,628	530	3.2
2015	17,843	100	0.6

Source: MWR-N, 1983.
*The number represents employees, their families, and other people supported (directly or indirectly) by the mine who have already or will migrate into Big Horn county.

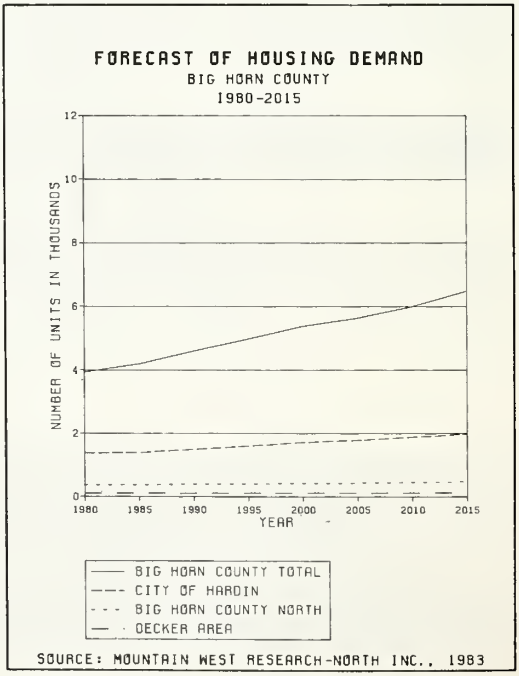


FIGURE III-2

From 4,070 units in 1983, demand for housing in Big Horn County would rise to 6,481 units by 2015, an increase of 59 percent. Increases in demand for housing in some parts of the county (the Decker area and the northern part) would not reach such high levels.

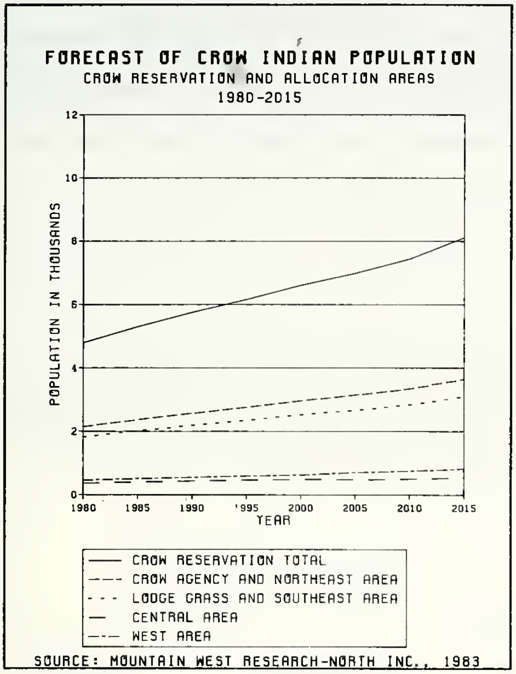


FIGURE III-3

Growth on the Crow Reservation will be rapid in the years ahead, rising from 5,102 in 1983 to 8,116 in 2015. The Crow Agency area will continue to be the most populated area with the Lodge Grass and southeast area close behind.

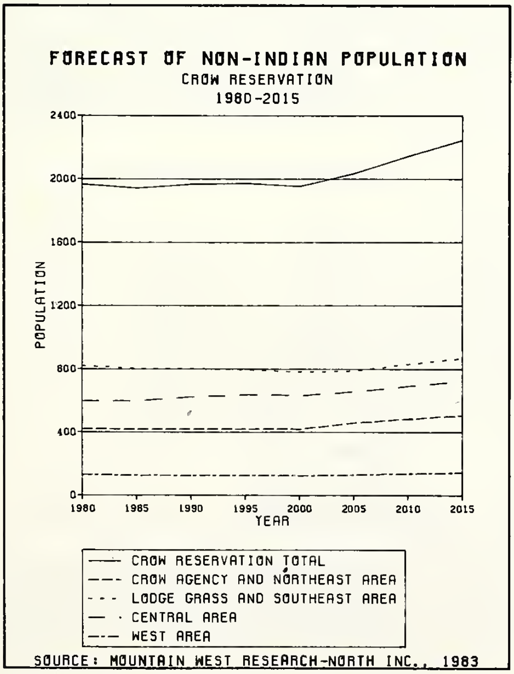


FIGURE III-4

The non-Indian population is not projected to grow over the next 20 years. By 2015, however, the population is projected to grow by 14 percent, rising to 2,245 from 1,948 in 1983.

Housing

Table III-8 shows projected housing demand and the ability of local developers to meet that demand through the year 2015. Today, demand is slightly above the builders' capacity. It is likely that local builders would expand their capability or nonlocal builders would provide the capability to supply all housing needed. None of the increased housing demand would stem from the Absaloka Mine's operation.

Northern Cheyenne Reservation

Population

No growth is projected for the non-Indian population, but rapid growth (over 65 percent by 2010) is forecast for the Indian population (fig. III-5 and app. D, table D-8). This is true for both the total reservation and the Big Horn County portion of the reservation. The population growth would be produced by natural increase, not from in-migration caused by mine jobs.

TABLE III-8

Forecast of Housing Unit Demand/Supply
Crow Reservation (Crow Indian Population Only)

Year	Total Demand	Demand Over Previous Year	Local Supply Response (Limit = 40)	Cumulative (Deficit) Surplus
1980	1,117			
1981	1,150	33	33	0
1982	1,181	31	31	0
1983	1,223	42	40	(2)
1984	1,261	38	40	0
1985	1,294	33	33	0
1986	1,336	42	40	(2)
1987	1,371	35	37	0
1988	1,415	44	40	(4)
1989	1,451	36	40	0
1990	1,480	29	29	0
1995	1,645	165 for 5 years	33 per year	0
2000	1,833	188 for 5 years	38 per year	0
2005	1,936	103 for 5 years	21 per year	0
2010	2,060	124 for 5 years	25 per year	0
2015	2,247	187 for 5 years	37 per year	0

Source: Mountain West Research-North, Inc., 1983.

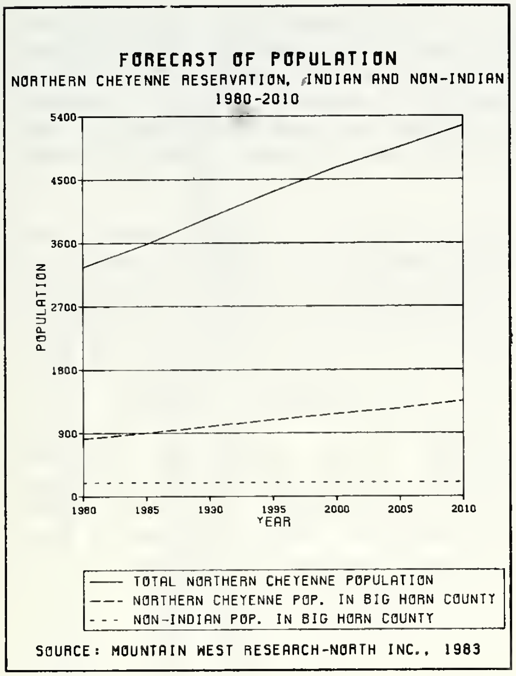


FIGURE III-5

In the Big Horn County portion of the reservation (center graph line) the Indian population is expected to increase from 822 in 1980 to 1,358 in 2010. Meanwhile, the non-Indian population (lower graph line) is projected to remain stable at about 196. (See also app. D, table D-8.)

Housing

The demand for housing by Indians is expected to increase dramatically over the next 30 years: From the 1980 number of 217, demand would increase 30 percent by 1990, 68 percent by 2000, and 106 percent by 2010. Since housing demand arises from natural population increase, none of the demand would be related to the Absaloka Mine.

SOCIAL AND COMMUNITY SERVICES

Summary of Impacts: More social and community services would be needed in Big Horn County and on the Crow Reservation in the future. All new service demands would come from natural population increase, not the continued operation of the Absaloka Mine. Thus, impacts to social and community services from mining activity would be minor.

Big Horn County

Big Horn County and Hardin are forecast to adequately serve most of their populations' needs throughout the life of the Absaloka Mine. Table III-9 summarizes social and community services and personnel needs through the year 2015.

By 2015, more facilities and personnel would be needed for the Big Horn County shop, Hardin engineering and public works department, county social services, and county schools. Only the need for school personnel is especially large. The school would need 40 additional teachers by 2015. Meeting other facility and personnel needs should present no special difficulty for the county or city, since the needs would build over a long, about 30-year, period.

The Absaloka Mine's current or continued operation hardly affects the county's projected facility and service requirements. In the proposed (13-year) mine plan (through 1995), less than 4 percent of the county's population is the result of the mine's operation. (Population "resulting from the mine" means in-migrating employees, their families, and other in-migrating people supported, directly or indirectly, by the mine.) Most new demands projected for facilities and services would stem from natural population increase.

For the life-of-mine plan, the percentage of the population resulting from the Absaloka Mine would gradually decrease after 1995. The decrease, about 0.1 percent every 5 years through 2015, would result from stable mine employment levels. That is, the number of employees (about 265) would stay the same, while the population of the county would constantly increase.

Crow Reservation

Two service areas--hospital and human and health services--are projected to require substantially more facilities and personnel over the next 30 years. By 2015, the reservation would need nine more employees and 2,400 more square feet of space to adequately supply human and health services (table III-9). and eight more hospital beds, five more doctors, and three more dentists.

None of these facility and personnel needs are the product of new population caused by the Absaloka Mine. Rather, the requirements are produced by a natural increase in population.

FISCAL CONDITIONS

Summary of Impacts: In both the application and life-of-mine plans, tax revenues would vary with coal production, but the general fiscal condition of the government units surrounding the mine would remain unchanged from recent years.

Big Horn County Government

Until shutdown, the mines in Big Horn County would continue to provide the bulk of the county's general fund revenue. This mine-related revenue (considered "local") would come mainly from property taxes on coal production, mine equipment, and facilities.

TABLE III-9
Public Facility and Personnel Requirements in Big Horn County
1984-2015

	Requirements Above 1983 Levels					
	County		Hardin		Crow Reservation	
Facility/Service	Facilities	Personnel	Facilities	Personnel	Facilities	Personnel
General Government	0	0	0	1	0	0
Law Enforcement	0	0	na	na	0	1
Shop/Engineering/Planning	3,000 sq ft	2	+	2	na	na
Fire	0	0 (volunteers)	0	0 (volunteers)	na	na
Hospital	0	0	na	na	8 beds	5 doctors 3 dentists
Library	+	0	na	na	na	na
Human/Health/Social	800-1,300 sq ft	3	na	na	2,400 sq ft	9
Developed Parks	0	0	2 acres	0	na	na
Solid Waste	0	1	0	0	na	na
Sewage	na	na	0	0	na	na
Water	na	na	0	0	na	na
Schools	8,100 sq ft	40 teachers	na	na	na	na

Source: MWR-N. 1983
Note: na means not applicable, the jurisdiction does not supply this public service; "+" means some additional space will probably be needed, but the amount has not been determined.

Big Horn County's future fiscal position would vary considerably, depending on mine production and the level of county services. If today's tax rate remains unchanged, for example, the county would spend more than it takes in starting in 1984 and extending through 1986. In other words, at today's level of county services, the current tax rate would not raise enough money to pay all the county's obligations. (This assumes that Spring Creek Mine would be in full production in 1986 and that no new mines would be built in the county [MWR-N, 1983, p. 4-63].)

Beginning in 1987 and continuing through the end of the century, the fiscal situation would reverse: today's tax rate would be enough to cover all obligations. When the Spring Creek, Decker, and Absaloka Mines close, as projected, in the first part of the 21st century, tax base and tax revenue would fall. Tax revenues would again become insufficient to pay for the level of services offered today. (MWR-N, 1983, p. 4-63). In 2015, the last year for which projections were made, total expenditures would more than double total revenues (MWR-N, 1983, p. 4-63).

Despite the projections, no deficits would in fact occur. The numbers merely illustrate the enormous effect of the mines' taxable value. When deficits appear in the budget, the county commission would either raise the tax rate, find other sources of revenue, or reduce expenditures (MWR-N, 1983, p. 4-63).

City of Hardin

Because the population increase resulting from Westmoreland's proposal would be small, and because the mine lies outside the town's taxing jurisdiction, future impacts would be modest. Any impacts that would occur would be difficult to distinguish from other influences unrelated to the mine. The population decline after mine closure would likewise be modest and not significantly reduce the costs of city government.

Crow Reservation

As long as Westmoreland mines coal from the Crow Tract III lease, the Tribe would have a large source of local funding not subject to the year-to-year uncertainties of federal funding. From the application area, the Tribe would receive royalties totalling about $42.4 million over 13 years (at current prices and royalty rates). <u>Annual payments would average about $2.5 million under the current Crow-Westmoreland coal lease.</u>

<u>The royalty rate on coal mined in excess of the first 77 million tons will be renegotiated in late 1984. The totals given here could therefore change. Lease provisions state that neither party shall request royalty rates that are clearly above or below the rate currently being paid for coal of a like quality and quantity mined in the region. Current royalty rates are from 15 to 20 cents per ton or 6 to 12.5 percent of the FOB mine price (contract sales price plus production taxes). Depending on the negotiated rate, royalties on Crow coal could range from 6 to 12.5 percent of the FOB mine price.</u>

In the life-of-mine plan, a large proportion of the Crow coal production would be at the royalty rate yet to be negotiated. If the new rate is 12.5 percent of the FOB mine price, total royalties would amount to about $338 million; yearly amounts would not reach above $2.5 million until 1990, unless current market conditions and prices improve.

School Districts

As long as the Absaloka Mine operates, most school district funding would continue to be local. Relatively low property tax rates would continue and both the elementary and high school district (17H and 1) would not face difficulties in raising sufficient revenue to fund their operations.

The loss of taxable value caused by the closure of the mine in 1995 (2015 in life-of-mine plan) would result in a return of premining fiscal conditions in the districts. The percentage of revenue raised locally would fall sharply and the burden for school funding would be shifted to other taxpayers. The Decker area mines, while in production, would bear the brunt of the shifted tax burden. After the Decker area mines closed, much of the burden would be shifted back, through the State School Foundation program, to the other taxpayers in the state.

State Revenues

Assuming fourth quarter 1982 coal prices, state revenues from 1985-1997 production at the mine would total about $146.8 million, $133.3 million in Severance taxes, $2.2 million in Resource Indemnity Trust taxes, and $2.28 million in royalties. Annual revenue would generally be around $11.5 million. In the life-of-mine plan, state revenues would be greatly increased. Total revenues would amount to about $575 million. The Severance Tax would account for $562 million (97.7 percent of the total), Resource Indemnity Trust Taxes for $9.4 million, and royalties for about $3.2 million.

Federal Revenues

Under the proposed plan, Federal Black Lung taxes would amount to about $26.1 million and the Abandoned Mines Tax would raise $22.8 million. In the life-of-mine plan, Black Lung taxes would raise $121.6 million and the Abandoned Mines Tax $95.6 million.

LAND USE

Summary of Impacts: Mining would temporarily eliminate agricultural uses on the minesite. After reclamation, cropland would be eliminated, ponderosa pine would decrease, and the amount of rangeland would increase (fig. III-6). The loss of agricultural production to the region would be negligible.

Grazing

After mining, the amount of rangeland in the application area would increase 59 percent, from 352 to 559 acres (table III-10). The rangeland disturbed would be out of production for approximately 5 years; 2 years for mining, regrading and revegetation and at least 3 years before cattle are allowed to graze (Michelle Mitchell, Westmoreland Resources, pers. commun., Sept. 6, 1983). Approximately 458 AUMs (animal unit months) would be lost as a result of mining in the application area. The increase in the number of acres of rangeland along with expected increased production of grassland vegetation (see Vegetation) would increase the total livestock forage available to the postmining landowner. The size of the increase would not be known until after the completion of postmining studies of vegetation and grazing potential. Stocking rates would probably be as high as today, possibly higher, owing to improved postmining range conditions and increased plant production.

TABLE III-10

Land Use Changes in the Application Area

Land Use	Acres Undisturbed	Acres Reclaimed
Rangeland	352	559
Cropland	154	0
Ponderosa Pine*	62	0
Other	5	14
TOTAL	573	573

*Closed-canopy stand.

Westmoreland's postmining grazing plan calls for a two-pasture rotation system. The early grazing season would extend from May through July, with the late season running from August through October. Grazing plans would be subject to approval by the Department of State Lands.

Water for cattle would be supplied by the reconstructed ponds (see Hydrology) and by two wells drilled into the sub-Robinson aquifer. Westmoreland proposes to use electric pumps to fill the stock tanks. Although the company does not specify, it is expected that the stock tanks would be in separate pastures. One stock tank would probably contain water from May through July and the other from August through October. Wildlife would probably also use stock tanks, especially with suggested modifications. (See Wildlife.)

Cropland

Because the number of acres of cropland in Tract III would decline (table II-17 and figs. II-16 and III-6) total potential annual production of both small grains and alfalfa would decline. In the application area, the 88 acres of alfalfa hayland and 66 acres of small grains would not be replaced, but

instead would be reclaimed to rangeland. At current average productivity levels, this would result in an annual loss of about 88 tons of alfalfa and either 990 bushels of wheat or 1,452 bushels of barley. In the future, these same areas, if returned to cropland, would probably produce similar yields of alfalfa and small grains because the soils replaced after mining would be similar to those that exist today. (See Soils.)

In the life-of-mine plan, a total of 394 acres of alfalfa and 721 acres of small grains would be reclaimed to rangeland. At current average productivity levels, this would result in a permanent annual loss of about 394 tons of alfalfa and either 10,815 bushels of wheat or 15,862 bushels of barley. The loss of the hayland (if permanent) would increase the postmining landowner's dependence on outside sources of hay for winter feeding.

Other Impacts

Because the population would change little as a result of the extension of the mine into the application area, little change would occur in the amount of urban use land. As happened during the 1970s, the land use changes that do occur would take place in or near existing communities.

TRANSPORTATION

Summary of Impacts: Mining as proposed would not noticeably change the amount of vehicle traffic on FAS 384 or the congestion at railroad crossings used by unit coal trains. Increased mining, at annual production rates up to 10 million tons per year, also would not noticeably affect highway traffic, but would aggravate railroad crossing congestion.

Traffic on FAS 384 would rise as mine employment rises. When the coal production rate goes from 4 million tons per year to the proposed 5-million-ton-per-year level, traffic would go up by about 24 percent. At the 10-million-ton-per-year level (the life-of-mine plan), traffic would go up by 120 percent. These increases would be well within the capacity of the newly reconstructed highway. They would not significantly change either the safety of the traveling public or the convenience of using the route.

About 2 miles of County Road 55 would have to be relocated in the life-of-mine plan. The impacts of the relocation cannot be estimated because no specific relocation plan is available. The Big Horn County Commission would have to approve the relocation.

Train traffic would also rise with production. The direction of increases in train traffic is not known, because train routes depend on the location of new coal sales. Primary market areas are expected to be the upper Midwest, where all customers are now located, and the Pacific Northwest. A

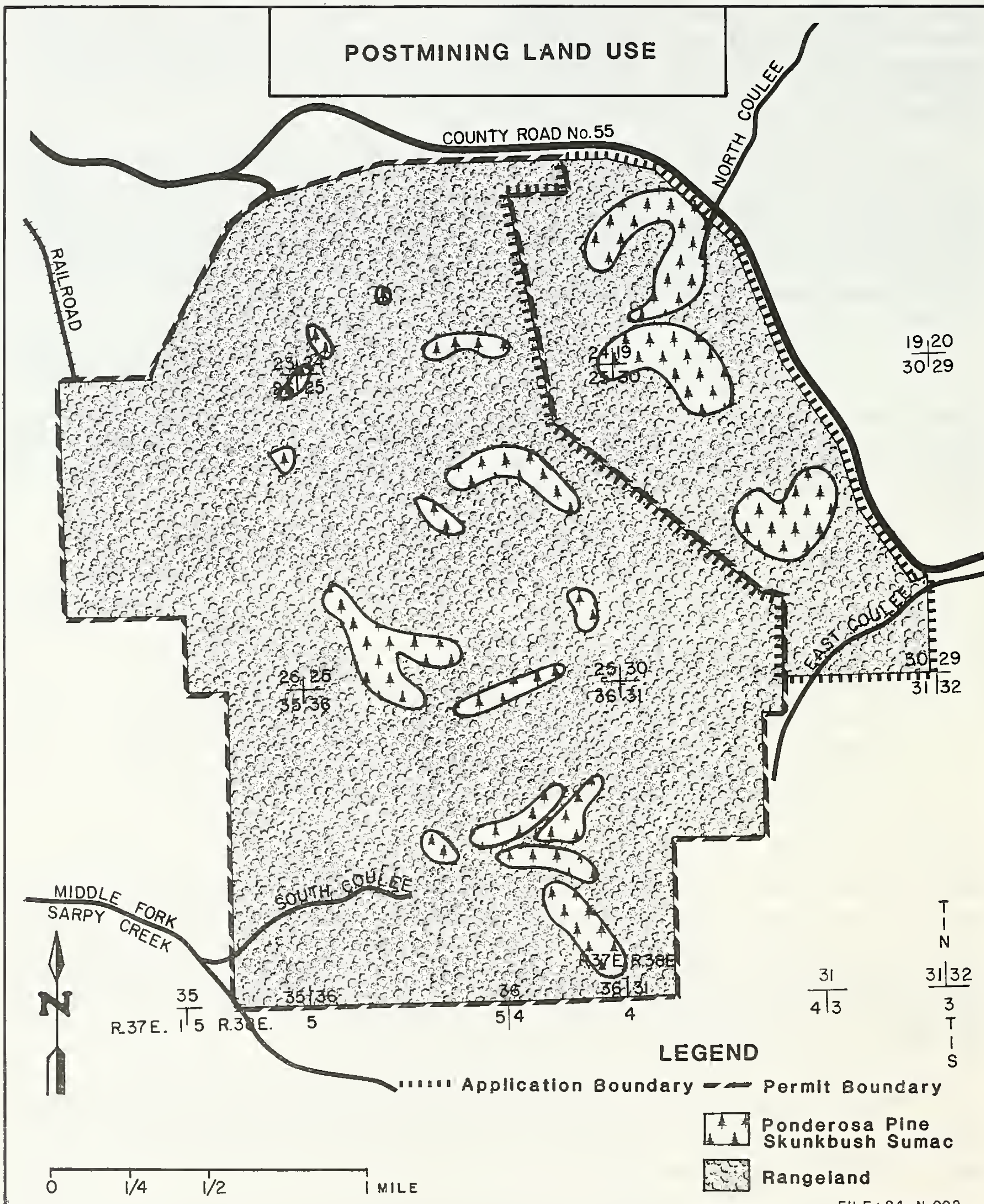


FIGURE III-6

After mining, Westmoreland would return the land to the premining land uses, primarily livestock grazing. The amount of cropland, however, would be less than before mining (fig. II-16).

reasonable assumption is that new sales will split evenly between these two market areas (David W. Simpson, Westmoreland Resources Inc., written commun., November 19, 1982).

The number of trains, at the full production level of 10 million tons per year, would average about 36 per week (18 each way) on the Westmoreland spur. Train traffic to the east of the spur (on the mainline) would increase from 14 to 25 trains per week, and traffic to the west (on the mainline) would go from zero to 11 trains per week. The increases in traffic would result in greater congestion at railroad crossings without over- or underpasses, causing increased delays in vehicle traffic. Specific problems would depend on the conditions at each crossing.

OUTDOOR RECREATION

Summary of Impacts: Further mining at the Absaloka Mine would not affect the quality of recreation in the region.

Regional recreation areas are sufficient to adequately serve the projected population of Big Horn County and the surrounding area well beyond the life of the Absaloka Mine. Use in specific areas may, however, periodically rise beyond capacity. Where such overuse would occur is unknown. The relatively small percentage of increased use projected cannot be broken down by recreation area.

Projected recreation activities are in part based on projected population increases. The portion of future regional population increase attributable to the Absaloka Mine is insignificant. Therefore, the portion of increased regional recreational use (which is minor) associated with the mine would also be minor.

CULTURAL RESOURCES

Summary of Impacts: The mine would not affect historical or archeological sites in the mine area that are either listed or eligible for listing on the National Register of Historic Places.

No archeologically or historically significant sites (eligible for National Register of Historic Places) would be affected by mining in the application area. In the life-of-mine area, none of the sites that might be destroyed (12 archeological and 5 historical) are eligible for the National Register.

All archeological sites in the life-of-mine area have been sufficiently recorded and, in some cases, tested and collected. The recording and collecting assure the preservation of cultural information. Historical sites have

also been recorded sufficiently. In 1979, the Montana State Historic Preservation Office acknowledged that Westmoreland Resources had "...complied with section 106 of the Historic Preservation Act on Tract II and III of the Absaloka Mine..." (Westmoreland Resources, 1983, bk. J, ex. J-4, revised April 1982). This compliance means that (1) there are no impacts on sites eligible for the National Register, (2) impacts on ineligibile sites have been mitigated by data (information) collection, and (3) that plans have been submitted and approved to mitigate any additional impacts on sites discovered during mining.

Because cultural resource inventories based on current technology may not have located all significant sites or data within the survey boundaries, some unrecorded sites could be destroyed.

AESTHETICS

Summary of Impacts: Westmoreland's operations would initially destroy the landscape of the mine area. After mining, reclamation would blend the minesite with surrounding lands. In the long term, aesthetic impacts would be <u>negligible</u>.

Proposed mining would not change the Absaloka Mine's industrial setting, which is now characterized by blasting, dragline excavation, coal handling, truck hauling, and facilities operation. This setting contrasts sharply with the surrounding unmined landscape.

Westmoreland proposes to mine 573 more acres. This would destroy the mined land's present scenery: rolling hills covered by ponderosa pine, grassland, and dry cropland, cut by draws growing with lush thickets of brush and small trees. The life-of-mine plan would destroy another 2,246 acres, increasing the total acreage disturbed by 2017 to 5,355.

Since reclamation would go on at the same time as mining, only about one-fifth of the 5,355 acres would be disturbed at once. At the end of mining, the reclaimed lands would have reached various stages of recovery, slowly growing toward a more natural condition, similar to surrounding lands.

The mine operations are and would continue to be visible to few people. The mine lies in an isolated area not frequently passed by visitors, and the mine lands are closed to the public. Moreover, most views from the county road near the mine are often blocked by trees and hills.

The people most affected by mining would be area residents, about a dozen families. The change from a rural agricultural setting to an industrial one may be unpleasant for these residents.

The landscape that would be removed by mining is common in the plains region east of the Rocky Mountains in Montana. (See chap. II.) The most distinctive features lost by mining, in the life-of-mine area, would be nine

groups of sandstone pedestals and outcrops. Since these are common near the mine, their loss would be insignificant.

After reclamation, if revegetation is successful, the minesite would contrast little with nearby unmined lands. The reclaimed lands would have less diverse topography and vegetation, provide less interesting scenery, and may lack the appeal of unmined lands. But the topography and plants would be similar to what existed before mining. In the long term, the aesthetic impacts of mining would be insignificant.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Westmoreland Resources proposes to mine 65 million tons of coal over 13 years (or, in the life-of-mine plan, 278 million tons over the next 35 years); 9.3 million tons (or in the life-of-mine plan, 40.0 million tons) would be lost because of spillage, regulatory constraints, and limits on coal-extraction technology.

About 750,000 gallons of diesel fuel, 60,000 gallons of gasoline, and 35 million kilowatt-hours of electricity would be used at the mine each year under the proposed plan. An additional 10 million gallons per year of diesel fuel would be used to ship the coal by rail to market. In total, the proposed mine would burn 9.8 million gallons of diesel fuel, 455 million kilowatt-hours electricity, and 780,000 gallons of gasoline. Shipments by rail would consume a total of 130 million gallons of diesel fuel.

Under the life-of-mine plan, the company would use much more fuel. Each year, mine operations would on average use 1.5 million gallons of diesel fuel, 70 million kilowatt-hours of electricity, and 75,000 gallons of gasoline. Coal shipments would require another 20 million gallons of diesel fuel each year. In total, Westmoreland would consume 41 million gallons of diesel fuel, 1.9 billion kilowatt-hours of electricity, and 2.2 million gallons of gasoline. Coal shipments would demand a total of 546 million gallons of diesel fuel.

The mine plan as proposed would also use water: an average of 200 acre-feet per year, totaling 2,600 acre-feet. In the life-of-mine plan, the mine would use an average of 250 acre-feet per year, totalling 7,100 acre-feet. The majority of this water would be lost to evaporation and therefore would not be available for other uses downstream, such as agriculture. The population associated with the proposed mine would require an average of about 50 acre-feet of water per year (105 acre-feet in the life-of-mine plan).

The stratigraphy within the mine today would be permanently altered. The Rosebud-McKay and Robinson seams would be removed. Because the other strata are neither unique nor valuable, their loss would not be significant.

<u>Seven</u> springs would be permanently lost in the application area, and possibly three more would cease flowing, at least during mining. Of these <u>ten</u> springs, three are considered perennial water supplies. Westmoreland's proposed plan to restore these lost livestock and wildlife water supplies would

probably be successful in that one of the permanent impoundments constructed to replace the springs would have an estimated 90 percent probability of containing water throughout the summer of every year. Also, several wells constructed by Westmoreland would be reliable water supplies as long as they and their pumps are maintained. Biological productivity in and around the springs would also be permanently reduced.

Six historical sites would probably be destroyed in the application area. An additional 5 historical and 12 archeological sites would be damaged or destroyed in the life-of-mine plan. None of the sites that would be destroyed is eligible for the National Register of Historic Places. No information of historic or archeologic value would be lost, since all sites have been examined and their information recorded.

Mining in the application area would remove one great horned owl nest. The change in water sources would probably reduce the number and diversity of aquatic organisms. The closed-canopy ponderosa pine subtype would probably be eliminated, reducing thermal cover for deer. In the life-of-mine plan, mining would remove one prairie dog town, another great horned owl nest, one red-tailed hawk nest, and nine rock outcrops that may serve as habitat for a variety of animals.

Along with wildlife habitat, mining in the application area would reduce the amount of ponderosa pine vegetation type by 47 acres. The amount of drainage bottom vegetation would be halved. The closed-canopy subtype and some aquatic vegetation would probably be eliminated. Agricultural lands would also be removed from the area.

During mining, the topography of the mined area would change. The final topography would be about the same as today, though simpler. The landscape would change during mining from agricultural to industrial, but would largely return to today's condition within several decades after mining. The most distinctive features lost, in the life-of-mine area, would be nine groups of sandstone outcrops.

During mining, the acreage disturbed would not be available for grazing. Crop production during mining and afterwards would be eliminated, unless postmining landowners converted reclaimed rangeland to cropland.

SHORT-TERM USES VERSUS THE PRODUCTIVITY OF THE HUMAN ENVIRONMENT AFTER MINING

Coal from the Absaloka Mine now produces electricity and considerable tax revenues, royalties, and jobs. These benefits would continue throughout the life-of-mine plan at a cost of vegetative, wildlife, and livestock productivity.

In the long-term, after mining, the vegetative productivity and diversity of reclaimed lands would be similar to premining conditions. Coulee bottom vegetation and ponderosa pine vegetation types would take several decades to return to the approximate premining condition.

Mining would temporarily force wildlife populations from mined areas. Soon after reclamation, reclaimed grassland would again supply habitat, primarily for foraging animals. However, the regrowth of the cover provided by woody vegetation would take decades. Moreover, the complexity of vegetation types and wildlife habitat type mosaics would be simplified for many years, decreasing the quality of habitat for some species in the interim.

Aquatic habitat and associated fauna would be eliminated during mining. Species diversity and productivity, even after reclamation, would probably never equal premining conditions. The overall reduction in the quality of aquatic habitat may eliminate from the mine area certain vertebrate species, such as frogs, turtles and some songbirds.

Seven springs in the application area would be permanently destroyed by mining operations. Because they probably cannot be replaced, any biological productivity currently dependent upon these springs would also be lost, although the two permanent impoundments may partly mitigate the loss. One perennial spring that would probably cease flowing during mining would likely flow again following reclamation.

ADMINISTRATIVE

ALTERNATIVES

After reviewing Westmoreland's mining and reclamation plan, the Department of State Lands and the U.S. Department of the Interior must take one of the four alternatives listed in the introduction: (1) approve the application as proposed, (2) reject the application, (3) selectively reject approval of the application, or (4) approve the application with special conditions.

Chapter III described the impacts of approving the application as proposed and listed the effects of implementing special conditions (called mitigating measures). This chapter describes and analyzes application rejection and two levels of selective rejection. (The hydrologic analysis of the rejection and selective rejection alternatives is based on a technical document by Stiller and Associates, [1984b].)

REJECTION OF APPLICATION

The analysis of application rejection has been written to illustrate maximum impact to the company. The analysis assumes that the company would not apply for or receive another permit to mine coal within Tract III and that rejection of the application would result in the closure of the mine. Closure is assumed to come after Westmoreland finishes mining the coal within the existing permitted area (fig. IN-1). This is an assumption only, however. Rejection would not preclude Westmoreland from applying for permits to mine other parts of Tract III.

Effects on the Physical Environment

Rejection of the application would leave 260 million tons of Rosebud-McKay and Robinson coal in the ground. All of this coal is now leased from the Crow Tribe. The coal in section 36, leased from the state of Montana, would still be mined, perhaps at a higher annual production rate than today.

At proposed coal production rates, Westmoreland would be forced by 1985 to stop mining the coal leased from the Crow. The company would stop mining in section 36 after all coal is extracted in 1990.

As a result of rejection, the overburden strata that lie above the coal seam, as well as the landscape, surface waters, vegetation, and soils, would remain undisturbed. At the close of mining, total suspended particulate concentrations on the minesite would fall to levels similar to those measured in other undeveloped areas of southeastern Montana.

Both aquatic and wildlife habitats would stay as they are today. The quality and quantity of woody cover used by deer, turkeys, grouse, and songbirds would not be lost. The vegetation and wildlife habitat type mosaics

would remain complex. Two great horned owl nests, one redtailed hawk nest, one prairie dog town, nine major sandstone outcrops, a number of acres of closed-canopy ponderosa pine forest, and 12 water sources that have been identified as important to wildlife would not be destroyed. However, the opportunity to increase wildlife foraging areas and improve pronghorn habitat through reclamation would be lost.

Rejection would stop the destruction of six historic sites. None of the sites is eligible for the National Register of Historic Places.

Effects on the Social and Economic Environment

Rejection of the application would eliminate 115 jobs. Both the number and diversity of jobs available in Hardin and on the reservation would therefore decline. Many of the mine jobs today are held by Crow Indians. The loss of these jobs and those funded by the 10 percent of the royalties used for tribal government would reduce employment opportunities for tribal members.

The effect the job losses would have on local "secondary" employment (nonmining jobs created by mine jobs) would be minor. In Montana as a whole, total employment would not necessarily be affected. Most secondary employment from the Absaloka Mine now arises in Billings, where the effect of mine closure would be negligible.

The effect on population growth from job losses would also be minor. After application rejection, the population of Big Horn County would grow 15.5 percent by 1995 (to 14,043), instead of 17.5 percent (to 14,308). The foregone growth would have gone to Hardin and northern Big Horn County.

The fiscal impact of application rejection would be enormous. In the application area alone, total Crow Tribe royalties would fall from $42.4 million to zero. The loss of this revenue would reduce the personal income of Crow Indian households by an average of about $700 per year over the 1985-1997 period.

Also severely affected fiscally would be two Big Horn County school districts: elementary district 17-H and high school district 1. Both districts would lose most of their tax base. Responsibility for school district funding would then shift in large part to the other mines in the county and Montana taxpayers in general (through the state school equalization levy).

Revenue to the state of Montana, by contrast, might not be affected by application rejection. If, for example, coal sales lost by the Absaloka Mine were taken by Rosebud, Spring Creek, or one of the Decker Mines, total state revenue would probably increase (owing to higher severance tax per ton collected from the Decker area mines). If the lost sales shifted to mines outside the state, revenue losses would be large.

SELECTIVE REJECTION

The agencies are considering two selective rejection options. The first of these options, A, considers mining only the double-seam coal (Rosebud-McKay and Robinson seams). In this option, the part of the application area that contains only the Robinson coal seam would not be mined, leaving most of the North Coulee drainage within the application area undisturbed (fig. IV-1). As a result, this option would disturb only 432 acres, whereas the proposal would disturb 573 acres.

The second selective rejection option, B, considers a level of mining within the application area that would have the least effect on North Coulee's most important wildlife water sources (springs 5, 8, 11 and 12). In this option, the single Robinson coal seam and portions of the Rosebud-McKay coal seam adjacent to North Coulee would not be mined, thus leaving a greater portion of the North Coulee drainage undisturbed (fig. IV-2). Only 270 acres would be disturbed in this option.

Option A

Effects on the Physical Environment

Hydrologic impacts to North Coulee from mining under option A would be less than those resulting from the application plan. Because mining in option A would be limited to those portions of upper North Coulee underlain by both the Rosebud-McKay and Robinson coal seams, much of the coulee bottom itself would not be disturbed. As a result, the springs depending mainly on coulee-bottom alluvium and colluvium would probably not be lost to mining. Springs 11 and 13 probably would not be affected. Springs 5, 8, and 12 (fig. II-2) may discharge less water, or may dry up seasonally when the coulee's ground water table drops. Five springs, numbers, 3, 4, 7, 9, and 10, (fig. II-2) would still be destroyed.

Because Westmoreland would not mine the upper part of North Coulee under option A, two permanent impoundments proposed in the application plan would not be built. Therefore, all postmining surface runoff from the upper North Coulee watershed would flow unimpeded into East Fork Sarpy Creek. Surface runoff and sediment reaching East Fork Sarpy Creek may increase slightly after mining, but no measurable impact to East Fork Sarpy Creek is likely or expected.

Other ground and surface water impacts stemming from option A would be the same as those identified in chapter III, Hydrology, although of lesser magnitude. Reclamation under this option would probably not be able to blend mined lands smoothly with undisturbed portions of North Coulee without great cost. Consequently, an unusual drainage network could result, although it may be as stable as the postmining drainage network proposed in the application plan.

Option A's impacts on soils and overburden would be about the same as those expected under the application plan. The only difference would be that fewer acres would be disturbed. The reclamation potential would be the same.

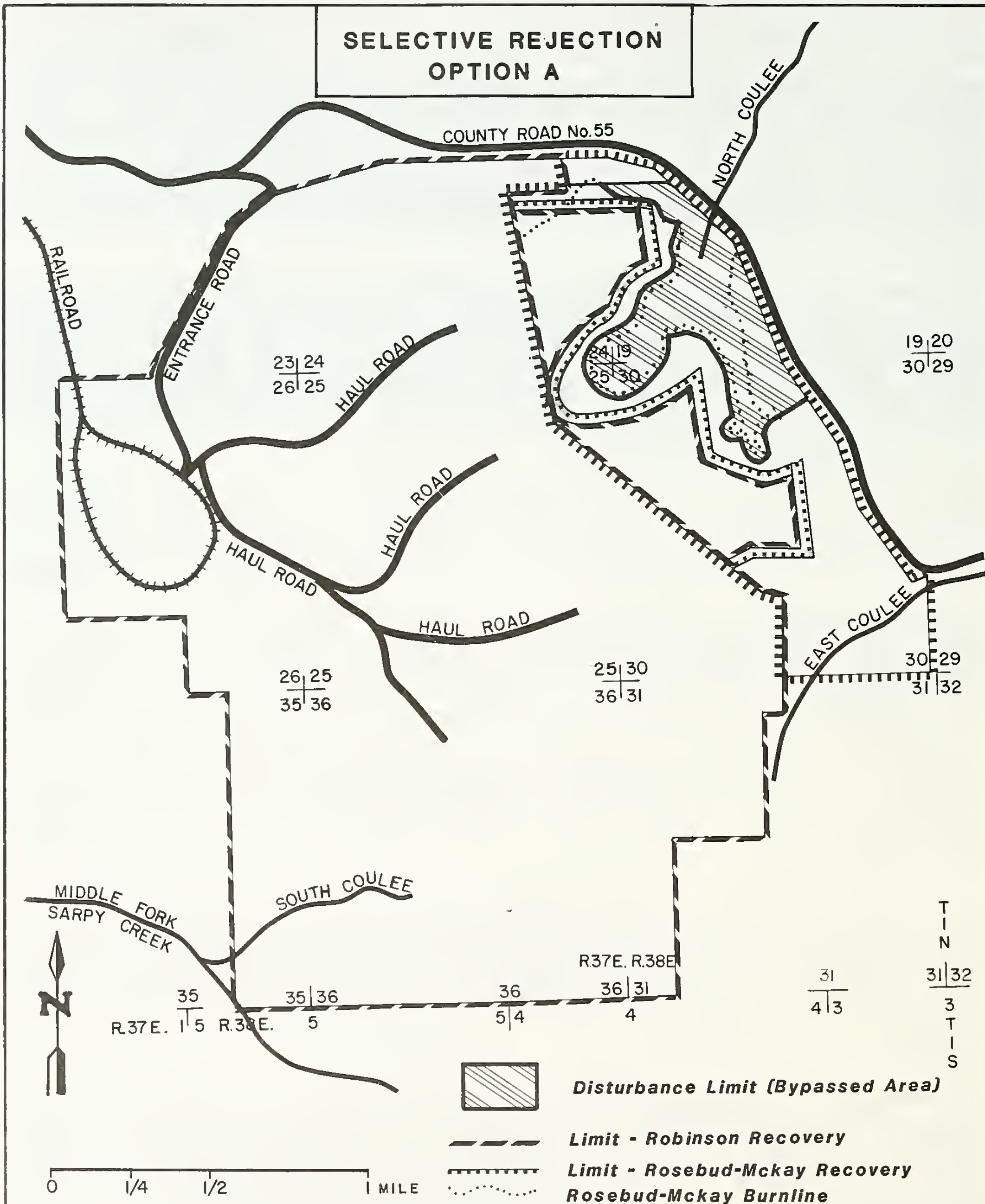


FIGURE IV-1

Option A would prevent Westmoreland from mining most of the North Coulee. The Rosebud-McKay burn line (the edge of the Rosebud-McKay coal seam) would mark the limit of disturbance. To the northeast of the line, only the Robinson coal seam is present.

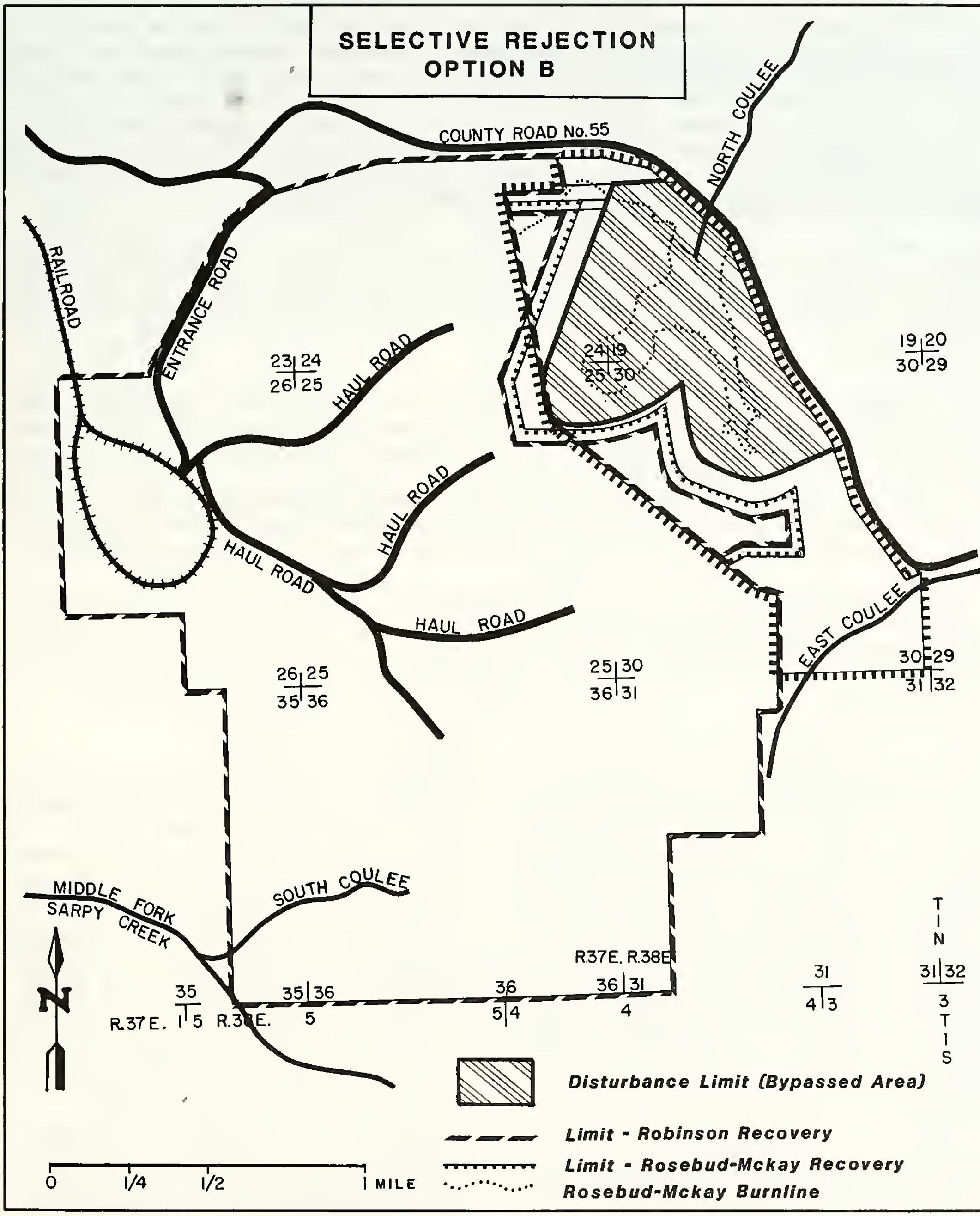


FIGURE IV-2

Option B would prevent Westmoreland from mining not only the single seam Robinson coal, but also a strip of additional land essential to the continued flow of the North Coulee's largest springs.

The impacts on vegetation and wildlife habitat would also be similar to those expected in the application plan. Assuming Westmoreland replanted vegetation of the same kind and in the same places specified in the application, option A would have one more acre of the deciduous tree/shrub and riparian type and 6 more acres of agricultural land than before mining (table IV-1, table III-3). The amount of ponderosa pine and grassland vegetation would decline slightly. The success of the revegetation methods under option A would be essentially the same as those in the application plan.

The amount of vegetation around ponds in option A would not be much different from the situation created by the application plan. Two perennial and two seasonal water sources (excluding wells) would be available (table IV-2). Option A, however, would require less revegetation and no pond construction.

Because of the difference in disturbance acreages, option A could potentially have less impact on wildlife, since fewer acres would require reclamation. (See chapter III, Hydrology and Vegetation.) Moreover, wildlife would be temporarily displaced from only 432 acres, compared to 573 acres in the application plan. Both mining plans would create a potential for desertion of a red-tailed hawk nest. The application plan would destroy a great horned owl nest, whereas option A would only increase the potential for nest desertion.

Less aquatic habitat would be disturbed in option A than in the application plan. Compared to the application plan, one spring would remain unaffected and three springs would have a decrease in flow. Therefore, the impact to aquatic life in option A would be less than in the application plan.

Effects on the Social and Economic Environment

Approximately 10 million tons of recoverable coal would be bypassed under option A (David Simpson, Westmoreland Resources, written comm., Sept. 10, 1984). Assuming 1982 tax and royalty rates, foregone revenues would equal about 66 percent of the total payments generated by coal mined in the application plan. Royalty payments to the Crow Tribe would be approximately $12.5 million, compared to $19.0 million in the application plan. Foregone state revenue would be $20.7 million in severance taxes and $340,000 in Resource Indemnity Trust taxes. Gross proceeds taxes collected by Big Horn County would decline by $3.6 million. Real and personal property taxes would be the same under either the application plan or option A, unless the mine plan for option A required equipment different from what would be required for the application plan. Foregone federal revenues would total $4 million in Black Lung taxes and $3.6 million in Abandoned Mine Tax revenues (table IV-3).

After a preliminary investigation, Westmoreland concluded that option A would cause increased production costs. The increases would result from operation of two short pit segments, instead of one long continuous pit; additional reclamation costs; and possible increased stripping ratios (David Simpson, Westmoreland Resources, written comm., Sept. 10, 1984). The existence and magnitude of production cost increases under option A would have to be verified by more detailed mine plan and engineering cost studies.

TABLE IV-1

Impacts of Options A and B on Acreages of Vegetation Types Within the Application Area

	Option A			Option B		
Vegetation Type	Acres Not Disturbed[1]	Acres Reclaimed[2]	Total	Acres Not Disturbed[1]	Acres Reclaimed[2]	Total
Grassland	72	342	414	146	222	368
Ponderosa Pine Forest	49	85	134	123	46	169
Deciduous Tree/shrub and Riparian	10	5	15	20	2	22
Agricultural						
Small grains	3	0	3	5	0	5
Alfalfa	3	0	3	5	0	5
Misc. Disturbance	4	0	4	4	0	4
TOTALS	141	432	573	303	270	573

[1]Source: Westmoreland Resources, 1983, ex. H-12, pl. 1. Dot-count method used.

[2]Source: Westmoreland Resources, 1983, ex. H-9, pl. 1. Planimeter method used. It is assumed that shrubs and grassland would substitute (option A) for the aquatic vegetation proposed for pond 19.

TABLE IV-2

Impacts of Options A and B on Water Sources for Wildlife

		Option A		Option B	
Source	Premining Water Availability	Water Availability[1]	Comments	Water Availability	Comments
Spring 5[1]	Perennial	Seasonal	May recover off-site, would require excavation	Perennial	No impact
Spring 7	Seasonal	None	Removed	None	Removed
Spring 8	Perennial	Perennial	Decreased flow	Perennial	No impact
Spring 10	Seasonal	None	Removed	None	Removed
Spring 11	Seasonal	Seasonal	No impact	Seasonal	No impact
Spring 12	Perennial	Perennial	Decreased flow	Perennial	No impact
Well No. 1[2]	Absent	May-July	Pumping required, long-term operation unknown	May-October	Pumping required, long-term operation unknown
Well No. 2[2]	Absent	August-October	Pumping required, long-term operation unknown	None	Not installed

[1]This table assumes that spring 5 would lose its perennial nature due to low flow under premining conditions and that springs 8 and 12 would have sufficient flows to maintain their perennial nature.

[2]Source: Westmoreland Resources, 1983, ex. H-9, pl. 1.

Table IV-3

Comparison of Total Tax and Royalty Payments
(in millions)

	Tons Mined	Crow Royalties	State Severance Tax	Resource Indemnity Trust	Gross Proceeds	Black Lung	Abandoned Mines Reclamation	Value of Bypassed Coal[1]
Proposal	29.3	$19.0	$60.1	$.99	$10.5	$11.7	$10.3	-0-
Option A	19.2	12.5	39.4	.65	6.9	7.7	6.7	$74.2
Option B	8.1	5.3	16.6	.27	2.9	3.2	2.8	155.7

[1]Value of bypassed coal is based on 1982 contract sales price.

Option A's impact on transportation, social conditions, and social and community services, would not differ from the impact of the application plan, except that impacts would occur over less time. The life of mine would be shortened by 2.5 years at current annual production rates or one year at projected production rates beginning in 1992.

Postmining land use under option A would provide 548 acres of rangeland. Other agricultural production could include 5 acres of alfalfa and 3 acres of small grains (table IV-4).

Table IV-4

Land Use Acreage Comparisons of
Options A and B

Alternative	Rangeland	Small Grains	Alfalfa
Premining	202	66	88
Proposal	559	0	0
Option A	548	3	5
Option B	537	3	5

Option B

Effects on the Physical Environment

Impacts on North Coulee's ground and surface water under option B would be less than those resulting from either the application plan or option A. Because mining under option B would be limited so as to preserve the general nature of springs 5, 8, 11, and 12, mining disturbance would avoid both the

majority of North Coulee and the Rosebud-McKay clinker that recharges springs 5, 8, and 12. Accordingly, springs 5, 8, 11, and 12 probably would not be affected by mining under this option. Spring 13 also would not be affected. The remaining springs in upper North Coulee (3, 4, 7, 9, and 10) would be destroyed.

Other hydrologic impacts resulting from mining under option B would be the same as those for option A. Reclamation of the mined land under option B would likewise fail to blend smoothly with undisturbed areas of North Coulee. An unusual drainage network would probably result.

Option B's impacts on soils and overburden would be about the same as those expected in option A and the application plan. The only difference would be that fewer acres would be disturbed. The reclamation potential would be the same.

Mining under option B would preserve 20 acres and, after mining, reestablish 2 additional acres, of the deciduous tree/shrub and riparian type (table IV-1). In the application plan, only 14 acres of these types would be reestablished. Option B would result in 32 more acres of ponderosa pine than the application plan, but 54 fewer acres of grassland. Vegetation around ponds would be slightly improved under option B. Although both plans would have 4 total water sources after mining, option B would preserve the relatively large, perennial spring number 8 and associated vegetation (table IV-1; table III-4). The success of revegetation methods under option B would be essentially the same as for the proposal.

Option B would have much less impact on wildlife habitat than both option A and the application plan. The mining of only 270 acres would cause less wildlife displacement and less habitat destruction. Most important, 123 acres of ponderosa pine and 20 acres of coulee-bottom vegetation would be preserved (table IV-1). These two types provide essential cover for deer, turkeys, grouse, and several nongame species. (See chapter II, Wildlife.) However, option B would preserve only 10 acres of cropland and, like the application plan and option A, would not replace cropland removed by mining. As a result, important forage for deer, turkeys, and grouse would be lost in option A, option B, and the application plan.

Water sources would be slightly better for wildlife under option B than under either option A or the application plan. Although all three plans would result in four water sources after reclamation (excluding wells), option B would preserve perennial spring 5 and not remove or decrease flows to perennial springs 8 and 12 (table IV-2). Owing to the uncertainty of how the wells would be operated and maintained in the long term, there may be no benefits to wildlife. Moreover, it is not known if Westmoreland or future landowners would improve well water sources for wildlife.)

As in option A, the great horned owl nest would be preserved. The potential for nest desertions at the owl and red-tailed hawk nests would remain, although at decreased probabilities.

Five springs in option B that would be affected in the application plan would either not be affected, or show only a decrease in flow. Since less habitat would be disturbed than in either the application plan or option A, the impacts on aquatic organisms would also be less.

Effects on the Social and Economic Environment

Under option B, 21.2 million tons of recoverable coal would be left in place--double the tonnage bypassed under option A. Foregone royalties and taxes (assuming 1982 prices and tax rates) would total $13.7 million in royalties to the Crow Tribe; $43.5 million in state severance taxes; and $720,000 in Resource Indemnity Trust taxes. Foregone gross proceeds collections would reach $7.6 million. Property tax collections would remain the same as those under the application plan, unless option B required different mine equipment. Federal tax revenues foregone would include $8.5 million in Black Lung taxes and $7.5 million in Abandoned Mines tax revenue (table IV-3).

A preliminary investigation by the company indicates that option B is not economically feasible (David Simpson, Westmoreland Resources, written comm., Sept. 10, 1984). The option would bypass low overburden coal, causing stripping ratios to markedly increase. Other conditions identified by the company that could contribute to increased production costs are separation of mining into two short pits (instead of one long pit) and increased reclamation costs. Additional engineering and mine plan studies would have to be undertaken to verify such production cost increases.

Option B would have the same impacts on transportation, social conditions, and social and community services as the application plan, except such that impacts would occur over less time. Option B would shorten the life of mine by 4 years at current production rates and 2 years at proposed production rates beginning in 1992.

Postmining land use in option B would provide 537 acres of grassland. Other possible agricultural production could include 5 acres each of alfalfa and small grains (table IV-4).

THE PREFERRED ALTERNATIVE

Many of the impacts stemming from the proposal would also result from the alternatives. As a result, a decision on the preferred alternative calls for a comparison of only six main subjects, whose impacts differ sharply among alternatives. (See table IV-5.)

Based on a comparison of the environmental, social, and economic advantages and disadvantages of each alternative, the Montana Department of State Lands and the U.S. Department of the Interior recommend approval of Westmoreland's application with six special conditions. These conditions would require the company to--

Table IV-5

Comparison of Alternatives
(Application Area Only)

	Preferred Alternative	Application Plan	Application Rejection	Option A	Option B
Hydrology					
Postmining water sources for cattle and wildlife					
Perennial	2[a]	2[a]	3	2	3
Seasonal	2	2	3	2	2
Wells	2[b]	2	3	3	2
Total	6	6	9	7	7
Tons of coal mined (millions)	29.3	29.3	0	19.2	8.1
Taxes and royalties paid (millions of dollars)					
Gross proceeds (county revenue)	10.5	$ 10.5	0	$ 6.9	$ 2.9
Crow royalties	19.0	19.0	0	12.5	5.3
State severance tax	60.1	60.1	0	39.4	16.6
Resource indemnity trust	1.0	1.0	0	0.6	0.3
Federal black lung	11.7	11.7	0	7.7	3.2
Federal abandoned mines	10.3	10.3	0	6.7	2.8
Total	112.6	$112.6	0	$73.8	$31.1
Acres disturbed	573	573	0	432	270
Wildlife habitat (acreage after mining)					
Grassland	361	422	202	414	368
Ponderosa pine	184	137	184	134	169
Deciduous tree/shrub and riparian	28	14	28	15	22
Cropland	0	0	154	6	10
Misc. disturbance	0	0	5	4	4
Land use (acreage after mining)					
Rangeland (acres)	515	559	386	548	537
Small grains (acres)	0	0	66	3	5
Alfalfa (acres)	0	0	88	3	5

[a]Includes one spring outside the application area.

[b]Stock tank with fenced overflow ponds.

(1) Replace the original acreage of ponderosa pine forest by planting pine in 47 more acres than now proposed.

(2) Accelerate the return of closed-canopy ponderosa pine forest by planting pine seedlings in ten 3- to 4-acre areas.

(3) Replace existing acreages of drainage-bottom vegetation (deciduous trees and shrubs and aquatic vegetation) by reestablishing snowberry and rose on an additional 17.5 acres of coulee bottom. (The 17.5 acres plus the 6.5 acres of proposed coulee-bottom vegetation plus the expected 3.7 acres of aquatic vegetation would provide 28 acres of total coulee-bottom vegetation. Westmoreland would also have to seed cattails, bulrushes, and sedges around the proposed permanent impoundments if, within 3 years, these species do not volunteer successfully.)

(4) Seed drainage-bottom grasses (app. E) around the parts of the proposed permanent impoundments that do not support aquatic vegetation.

(5) Construct fenced overflow ponds near the stock tanks. (The company would be required to fill both ponds whenever both permanent impoundments and spring 12 dry up. Otherwise, the ponds would only be filled when pastures are grazed by livestock. The period of use of these ponds would be expanded to 9 months (March-November) rather than 6 months (May-October) as proposed by Westmoreland. Fences would be constructed to protect the overflow ponds from use by cattle but not wildlife.)

(6) Construct fences limiting cattle access around the two permanent impoundments to protect developing vegetation.

These special conditions would lessen the impacts to wildlife that would occur under the application plan. The enormous fiscal impacts of rejection or selective rejection would not occur and coal recovery would be maximized in the application area.

The preferred alternative would, with reasonable probability, restore wildlife and livestock land uses to a condition similar to what exists today in the application area. Habitat diversity and forage-to-cover ratios for wildlife would more closely approximate premining conditions than in the application plan. Although wildlife use of the application area would be reduced during early reclamation, use would approach premining levels as woody plants mature and diversity increases. Most wildlife species would use the reclaimed area. Highly mobile species would be the first to return.

The distribution of postmining water sources, although fewer in number, would be similar to premining conditions. Except in the driest of years, two of the four postmining surface water sources would provide water for wildlife and livestock through the summer months. The construction of overflow ponds associated with wells would provide additional wildlife water sources.

The two wells with stock tanks would improve livestock management options after mining and would potentially improve livestock distribution. After reclamation there would be an increase in livestock forage available to the postmining landowner.

APPENDIXES

APPENDIX A

The Decker Area Mines Comprehensive Social Sciences Study

The Department of State Lands and the U.S. Office of Surface Mining hired a consultant to analyze the socioeconomic impacts that could result from opening three new mines--CX Ranch, Wolf Mountain, and Youngs Creek. Mountain West Research-North, Inc., the consultant hired, produced a comprehensive social sciences study describing past and present conditions and forecasting these conditions for the future in Big Horn County, Montana, and Sheridan County, Wyoming. The report also covered the Northern Cheyenne and Crow Indian Reservations.

Included in the report are discussions of a wide range of topics, each analyzed under four "scenarios." The report first gives an analysis of future socioeconomic conditions if none of the three proposed mines are built. This is called the baseline scenario. The effect of the Absaloka Mine can be inferred from this scenario. Following this are three mine development scenarios: the CX Ranch Mine as proposed, the 33-year CX Ranch Mine, and all three mines.

Copies of the report are available for public review in the Big Horn County and Sheridan County libraries and through the interlibrary loan system from the Montana and Wyoming state libraries.

Definition of Study Areas

Mountain West subdivided the larger area studied. The subdivisions, or subcounty study areas, were based on the locations of the proposed mines, the composition of local labor markets, commuting patterns, and trading relationships among communities. The subcounty areas were geographically defined to conform, as closely as possible, to governmental and planning jurisdictions that could be affected by the proposed mines.

Topics and Methodologies in the Social Sciences Study

Economic and Demographic

Forecasts of population, employment, and income were prepared for each subcounty area and jurisdiction for all scenarios. The forecasts were produced by a computerized model developed by Mountain West Research, called "Planning and Assessment System" (PAS). The model, adapted to the study area, gave forecasts used to identify significantly affected areas. Those areas in which little effect was forecast were dropped from the detailed impact evaluation process.

Social Life and Cultural Diversity

The approach used for social life and cultural diversity blended field observation, interviews, community surveying, secondary data analysis, and

historical research. The Guide to Social Assessment (BLM, 1982) served to organize the analysis. This was the first time the Guide was used for a mine plan in the Powder River Basin, and the Department of State Lands, Environmental Analysis Bureau, would appreciate comments on its effectiveness.

The basic assessment of social conditions was enhanced by studies of the following:

- Social history. Sheridan County, Big Horn County, the Crow Reservation, and the Northern Cheyenne Reservation were covered.
- Mine workers. This study developed a worker profile.
- Area residents in Big Horn and Sheridan Counties. Mountain West obtained information about attitudes, perceptions, social networks, and employment and demographic characteristics.
- Communities. This study delineated the response of various communities to energy development.
- Crow Reservation residents. Crow Tribe of Indians produced this study.

Housing

A housing demand and supply forecast was prepared for each subcounty area and scenario. The forecasts were based on the demographic forecasts.

Facilities and Services

A complete range of community facilities and services was examined for each scenario. The jurisdictions analyzed included two counties, the Crow Reservation, the Northern Cheyenne Reservation, five incorporated cities, five unincorporated places, three public high school and seven public elementary districts in Big Horn County, and two school districts in Sheridan County.

Fiscal

For each facility or service, detailed revenues and expenditures for each scenario were projected for affected jurisdictions. State and federal government revenues that would result from the proposed mines were also projected.

Transportation

Traffic on area roads and the rail system was projected for each scenario. The analysis included safety, capacity, and maintenance cost.

Outdoor Recreation

Average and short-term peak use of regional recreation sites was estimated for each scenario. The use was compared to the capacity of the recreational areas.

Land Use

Acreage needs by land use were projected for each scenario and compared to the land availability. The impacts of the proposed mines on land values were examined, as were land use changes on the proposed minesites.

Special Reports

In addition to the multi-volume social sciences study, Mountain West submitted twelve separate reports documenting the results of individual research efforts. The reports include:

- An historical overview of Big Horn and Sheridan Counties
- The Big Horn and Decker Mine Worker Survey
- A survey of Hardin, Decker, and Sheridan area residents
- A study of the effects of the end of coal mining
- Land value effects of the proposed mines
- An update on satisfaction, community change, and coal development in Decker, Montana
- Mining impacts on the wage rates in other employment sectors
- The effects of energy development on the cost of living and inflation
- Distribution of local purchases by the Decker area mines
- The effects of mining operations on the agricultural production of the CX Ranch
- A generic mitigation program for social and economic impacts
- The state, interstate, and federal mitigation authorities

APPENDIX B

Species of Invertebrates Collected on Westmoreland Tract III Lease Area During April, July, and October 1981

[Source: Westmoreland Resources, 1982, bk. G, vol. 3, ex. G-14, pp. 47-48]

DIPTERA--True flies
- Dolichopodidae--Burrowing flies
- Tipulidae--Crane flies
  - *Tipula* sp.
- Simuliidae--Black flies
  - *Simulium* sp.
- Ceratopogonidae--Biting midges
- Tribe Stilobezziini
  - *Culicoides* spp.
- Dolichopodidae
- Stratiomyidae--Soldier flies
  - *Euparyphus* sp.
  - *Stratiomyia* sp.
  - *Oxycera* sp.
- Tabanidae--Horse & Deer flies
  - *Chrysops* sp.
- Psychodidae--Moth flies
  - *Pericoma* sp.
- Dixidae--Dixa midges
  - *Dixella* sp.
- Chaoboridae
  - *Chaoborus* sp.
- Culicidae--Mosquitoes
  - *Aedes campestris*
  - *A. dorsalis*
  - *A. melanimon*
  - *A. increptis*
  - *A. stictus*
  - *Culex tarsalis*
  - *C. pipiens*
  - *Anopheles freeborni*
- Sciomyzidae
- Chironomidae--True midges
- Tanypodinae
  - *Larsia* sp.
  - *Macropelopia* sp.
  - *Hoffmeisteri*
  - *Paramerina* sp.
  - *Procladius* sp.
  - *Psectrotanypus* sp.
  - *Tanypus* sp.
  - Thienemannimyia gp.
- Diamesinae
  - *Diamesa* sp.

DIPTERA (continued)
- Chironominae
  - *Chironomus* spp.
  - *Paratendipes* sp.
  - *Phaenopsectra* sp.
  - *Polypedilum* sp.
  - *Cladotanytarsus* sp.
  - *Micropsectra* sp.
  - *Tanytarsus* sp.
  - *Parachironomus* sp.
- Orthocladinae
  - *Corynonuera* sp.
  - *Cricotopus* sp.
  - *Eukiefferiella* sp.
  - *Psectrocladius* sp.
  - *Pseudosmittia* sp.
  - *Rheocricotopus* sp.
  - *Thienemanniella* sp.

AMPHIPODA--Freshwater shrimp
  - *Hyallela azteca*

GASTROPODA--Snails
- Physidae--Pouch snails
  - *Physa* sp.
- Lymnaeidae--Pond snails
  - *Lymnaea* sp.
- Planorbidae--Orb snails
  - *Helisoma* sp.
  - *Gyraulus* sp.

PELECYPODA--Clams and Mussels
- *Pisidium* sp.

HYDRACARINA--Water mites

OLIGOCHAETAE--Aquatic earthworms
- Tubificidae
  - *Limnodrilus*
- Naididae
  - *Nais communis*

HIRUDINEA--Leeches
- Glossiphoniidae

Appendix B
(continued)

COLLEMBOLA
- Podura sp.

EPHEMEROPTERA--Mayflies
- Baetidae
  - Callibaetis sp.
- Caenidae
  - Caenis sp.

ODONATA--Dragonflies
- Aeschnidae--Darners
  - Anax sp.
  - Aeshna sp.
- Libellulidae
  - Sympetrum sp.
  - Libellula sp.
  - Pantala sp.
- Coenagrionidae--Damselflies
  - Amphiagrion sp.
  - Ceonagrion sp.
  - Enallagma sp.
  - Ishnura spp.
  - Argia sp.

HEMIPTERA--True bugs
- Corixidae--Water boatmen
  - Hesperocorixa laevigata
  - H. Vulgaris
  - Palmacorixa gilletti
  - Sigara alternata
  - S. bicolorpennis
  - S. decoratella
  - S. grossolineata
  - Corisella tarsalis
  - Coroxid nymphs
- Notonectidae--Back swimmers
  - Notonecta kirbyi
  - N. spinosa
  - N. undulata
  - Notonectid nymphs
- Gerridae--Water striders
  - Gerris buenoi
  - G. insperatus
  - G. notabilis
  - G. remigis
  - Gerris nymphs
- Hebridae
  - Merragatta sp.

HEMIPTERA (continued)
- Mesoueliidae
  - Mesouelia sp.
- Saldidae
  - Saldula sp.
- Nepidae
  - Ranatra sp.

TRICHOPTERA--Caddisflies
- Hydropsychidae--Net spinners
  - Hydropsyche sp.
- Limnephilidae--Tube-case makers
  - Anabolia sp.
  - Limnephilus sp.

COLEOPTERA--Beetles
- Curculionidae--Weevils
  - Hyperodes sp.
- Dryopidae--Riffle beetles
  - Helichus striatus
- Dytiscidae--Predaceous diving beetles
  - Agabus spp.
  - Colymbetes sp.
  - Dytiscus spp.
  - Graphaderus sp.
  - Hydrophorus spp.
  - Hydrovatus spp.
  - Illybius sp.
  - Laccophilus spp.
  - Rhantus sp.
  - Hygrotus sp.
- Elmidae--Riffle beetles
  - Stenelmis sp.
- Hydrophilidae--Water scavenger beetles
  - Berosis sp.
  - Helophorus sp.
  - Hydrobius sp.
  - Paracymus sp.
  - Tropisternus sp.
- Haliplidae--Crawling water beetles
  - Haliplus spp.
  - Peltodytes sp.
- Chrysomelidae--leaf beetles
  - Donacia sp.

APPENDIX C

Scientific Names of Wildlife Species Discussed in the Text

Common Name	Scientific Name
Mammals	
Mule Deer	Odocoileus hemionus
White-tailed Deer	Odocoileus virginianus
Pronghorn Antelope	Antilocapra americana
Coyote	Canis latrans
Bobcat	Lynx rufus
Black-footed Ferret	Mustela nigripes
Badger	Taxidea taxus
Long-tailed Weasel	Mustela frenata
Striped Skunk	Mephitis mephitis
Raccoon	Procyon lator
Porcupine	Erethizon dorsatum
Muskrat	Ondatra zibethica
White-tailed Jackrabbit	Lepus americanus
Desert Cottontail	Sylvilagus audubonii
Red Squirrel	Tamiasciurus hudsonicus
Least Chipmunk	Eutamias minimus
Black-tailed Prairie Dog	Cynomys ludovicianus
Deer Mouse	Peromyscus maniculatus
Meadow Vole	Microtis pennsylvanicus
Prairie Vole	Microtis ochrogaster
Wyoming Pocket Mouse	Perognathus fasciatus
Masked Shrew	Sorex cinereus
Birds	
Merriam's Wild Turkey	Meleagris gallopavo
Sharp-tailed Grouse	Pedioecetes phasianellus
Ring-necked Pheasant	Phasianus colchicus
Canada Goose	Branta canadensis
Mallard	Anas platyrhynchos
Gadwall	Anas strepera
Green-winged Teal	Anas carolinensis
Blue-winged Teal	Anas discors
American Widgeon	Mareca americana
Shoveler	Spatula clypeata
Northern Harrier (Marsh Hawk)	Circus cyaneus
Red-tailed Hawk	Buteo jamaicensis
Golden Eagle	Aquila chrysaetos
Bald Eagle	Haliaeetus leucocephalus
Prairie Falcon	Falco mexicanus
American Kestrel	Falco sparverius
Peregrine Falcon	Falco peregrinus
Great-horned Owl	Bubo virginianus
Screech Owl	Otus asio
Robin	Turdus migratorius
Yellow Warbler	Dendroica petechia
Rufous-sided Towhee	Pipilo erythrophthalmus
Western Meadowlark	Sturnella neglecta
Vesper Sparrow	Pooecetes gramineus

Appendix C
(continued)

Common Name	Scientific Name
Birds (cont.)	
Red Crossbill	Loxia curvirostra
Black-capped chickadee	Parus atricapillus
Solitary Vireo	Vireo solitarius
Reptiles and Amphibians	
Spadefoot Toad	Scaphiopus bombifrons
Western Toad	Bufo boreas
Western Painted Turtle	Chrysemys picta
Yellow-bellied Racer	Coluber constrictor
Gopher Snake	Pitouphis melanoleucus
Prairie Rattlesnake	Crotalus viridis
Fish	
White Sucker	Catastomus comersoni
Lake Chub	Couesius plumbeus

APPENDIX D

SOCIOECONOMIC TABLES

TABLE D-1

Big Horn County Population

Area	1970	1980	Percent Change
Montana	694,409	786,690	13.3
Male	347,005	392,625	13.1
Female	347,404	394,065	13.4
Big Horn County	10,057	11,096	10.3
Male	4,990	5,480	9.8
Female	5,067	5,616	10.8
Hardin City	2,733	3,300	20.7
Big Horn County North	110	949	762.7
Decker Area	245	189	-22.9

Source: U.S. Department of Commerce, Bureau of the Cenus, 1970 Census of the Population: Characteristics of the Population, Montana, Tables 19, 20, 34, 35, 49, 50; U.S. Department of Commerce, Bureau of the Census, 1980 Census of the Population: Characteristics of the Population, Montana, Tables 19, 20, 46.

Note: These figures do not reflect the undercount of Crow Indians in the 1980 U.S. Census.

TABLE D-2

Big Horn County Housing Units by Type

Type of Unit	1970	1980	Increase in Number of Units	Percent 1970-1980 Growth
Total Housing Units	2,900	3,867	967	33.3
Year-round Units	2,866	3,719	853	29.8
Single-family detached	2,420	2,777	357	14.8
Multifamily	273	467	194	71.1
Mobile homes	173	475	302	174.6

Source: U.S. Department of Commerce, Bureau of the Census, Detailed Housing Characteristics for Montana, 1970, 1980.

TABLE D-3

1980 U.S. Census and Revised Population Counts

	1980 Census[a]		Revised Count[b]	
Place	Total Population	Crow Indian	Total Population	Crow Indian
Big Horn County	11,096	5,315	12,180	6,375
Crow Reservation	5,645	3,840	6,758	4,792
Crow Agency and Northeast Area	2,100	1,696	2,564	2,144
Lodge Grass and Southeast Area	2,136	1,438	2,647	1,827
Central Area	937	343	958	362
West Area	472	363	589	459

Sources: [a]Department of Commerce, U.S. Bureau of the Census, 1980 Census Preliminary Population and Housing Unit Counts, January, 1981.
[b]Mountain West Research-North, Inc., 1982.

TABLE D-4

Public Outdoor Recreation Areas of Regional and County Importance

Area	Ownership*	Acres	Comments
REGION			
Pryor Mountain Wild Horse Range	BLM-NPS		Borders Big Horn County
Bighorn National Forest	USFS	1,115,125	Segment in Sheridan County; 0.7 percent in other ownership
Bighorn Canyon National Recreation Area	NPS	120,284	Segment in Big Horn County; 43.3 percent in other ownership
Ashland Division of Custer National Forest	USFS	502,152	Borders Big Horn County; 13 percent in other ownership
Pryor Division of Custer National Forest	USFS		Borders Big Horn County
BIG HORN COUNTY, MONTANA			
Arapooish Fishing Access Site	MDFWP		Deeded land along the Bighorn River within the boundaries of the Crow Reservation
Bighorn Fishing Access Site	MDFWP		Deeded land along the Bighorn River within the boundaries of the Crow Reservation
Two Leggins Fishing Access Site	MDFWP		Deeded land along the Big Horn River within the boundaries of the Crow Reservation
Grant Marsh Fishing Access Site	MDFWP	140	Access to Bighorn River 8 miles west of Hardin
Tongue River Reservoir	DNRC		Tongue River
Rosebud Battlefield	MDFWP	5,000	Historic Site with hunting in season
Custer Battlefield National Monument	NPS	755	Historic Site on Crow Reservation
Chief Plenty Coups State Monument	MDFWP	195	Historic Site on Crow Reservation
Scattered Parcels of Public Land	BLM	27,686	Generally Inaccessible

Sources: Montana Department of Fish and Game, Montana Statewide Comprehensive Outdoor Recreation Plan (SCORP), vol. 2., March, 1978; Bureau of Land Management, Public Information Office, 1982.

*BLM=Bureau of Land Management, NPS=National Park Service, USFS=U.S. Forest Service, MDFWP=Montana Department of Fish, Wildlife and Parks, DNRC=Montana Department of Natural Resources and Conservation.

TABLE D-5

Forecast of Big Horn County Housing Demand

Year	Big Horn County	City of Hardin	Big Horn County North	Decker Area
1980	3,935	1,371	364	96
1981	3,996	1,375	365	97
1982	4,011	1,368	363	96
1983	4,070	1,374	364	95
1984	4,126	1,380	365	96
1985	4,189	1,393	366	97
1986	4,262	1,406	368	98
1987	4,326	1,417	369	99
1988	4,406	1,433	372	100
1989	4,466	1,443	372	100
1990	4,596	1,496	385	104
1995	4,974	1,607	401	109
2000	5,374	1,721	418	113
2005	5,632	1,784	432	109
2010	5,997	1,882	455	114
2015	6,481	1,985	476	120

Source: Mountain West Research-North, Inc., 1983.

TABLE D-6

Forecast of Crow Indian Population
Crow Reservation and Allocation Areas

Year	Crow Reservation	Crow Agency and Northeast Area	Lodge Grass and Southeast Area	Central Area	West Area
1980	4,792	2,144	1,827	362	459
1981	4,895	2,189	1,865	371	470
1982	4,996	2,235	1,902	379	480
1983	5,102	2,282	1,941	388	491
1984	5,199	2,326	1,977	395	501
1985	5,300	2,371	2,015	403	511
1986	5,392	2,413	2,050	409	520
1987	5,486	2,456	2,085	416	529
1988	5,579	2,498	2,120	423	538
1989	5,669	2,539	2,155	429	546
1990	5,753	2,577	2,188	434	554
1995	6,162	2,763	2,350	459	590
2000	6,611	2,970	2,531	483	627
2005	6,992	3,143	2,671	471	707
2010	7,439	3,343	2,842	502	752
2015	8,116	3,648	3,100	547	821

Source: Mountain West Research-North, Inc., 1983.

TABLE D-7

Forecast of Crow Reservation Non-Indian Population

Year	Crow Reservation	Crow Agency and Northeast Area	Lodge Grass and Southeast Area	Central Area	West Area
1980	1,966	420	820	596	130
1981	1,966	419	818	600	129
1982	1,956	419	812	597	128
1983	1,948	419	807	596	126
1984	1,943	418	804	595	126
1985	1,941	418	801	597	125
1986	1,940	418	799	599	124
1987	1,939	418	794	601	123
1988	1,937	418	797	602	123
1989	1,933	417	791	603	122
1990	1,966	419	800	622	125
1995	1,972	418	793	636	125
2000	1,952	417	779	632	124
2005	2,034	459	788	656	131
2010	2,143	484	830	691	138
2015	2,245	507	869	724	145

Source: Mountain West Research-North, Inc., 1983.

TABLE D-8

Forecast of Population of
Northern Cheyenne Reservation

Year	Total Northern Cheyenne Population	Northern Cheyenne Population (Big Horn County)	Non-Indian Population (Big Horn County)
1980	3,255	822	196
1985	3,583	904	194
1990	3,960	1,000	198
1995	4,324	1,092	200
2000	4,670	1,180	200
2005	4,958	1,255	199
2010	5,262	1,358	197

Source: Mountain West Research-North, Inc., 1983.

APPENDIX E

Seed Mixtures for Revegetation

Species	Percent of Mix: Lowland Grassland[1]	Upland Grassland[2]	Drainage Bottom[3]
Cool Season Grasses			
Western wheatgrass (Agropyron smithii)	15	5	40
Green needlegrass (Stipa viridula)	15	5	0
Beardless wheatgrass (Agropyron inerme)[4]	15	10	0
Slender wheatgrass (Agropyron trachycaulum)	3	0	10
Thickspike wheatgrass (Agropyron dasystachyum)	2	0	10
Prairie junegrass (Koeleria cristata)	2	0	0
Kentucky bluegrass (Poa pratensis)	0	0	20
Warm Season Grasses			
Blue grama (Bouteloua gracilis)	10	0	0
Sideoats grama (Bouteloua curtipendula)	10	15	0
Little bluestern (Schizachyrium scoparium)	0	15	0
Sand bluestem (Andropogon halli)	0	15	0
Prairie sandreed (Calamovilfa longifolia)	0	15	0
Big bluestem (Andropogon geradi)	0	0	20
Forbs[5]	27	19	0
Shrubs[5]	1	1	0

[1]Seeding rate: 40 pure live seeds/square foot; about 15 lbs. pure live seeds/acre.

[2]Seeding rate: 24 pure live seeds/square foot; about 15 lbs. pure live seeds/acre.

[3]Seeding rate: 45 pure live seeds/square foot; about 15 lbs. pure live seeds/acre.

[4]Bluebunch wheatgrass (Agropyron spicatum), an ecological equivalent, would be used when available.

[5]See appendix F for species.

APPENDIX F

Forb, Shrub, and Tree Revegetation Mixtures

TABLE F-1
Forb and Shrub Species Used in Revegetation Seed Mixtures

Seed Mixture	Forage Class	Name	Scientific Name
Lowland grassland	Forb	Western yarrow	*Achillea millefolium*
		Purple prairie clover	*Petalostemum purpureum*
		Prairie coneflower	*Ratibida columnifera*
		Black Sampson	*Echinacea angustifolia*
		Dotted gayfeather	*Liatris punctata*
		Sainfoin	*Onobrychis* sp.
		Cicer milkvetch	*Astragalus* sp.
	Shrub	Fourwing saltbush	*Atriplex canescens*
		Silver sagebrush	*Artemisia cana*
Upland grassland	Forb	Arrowleaf balsamroot	*Balsamorhiza sagittata*
		Western yarrow	*Achillea millefolium*
		Purple prairie clover	*Petalostemum purpureum*
		Black Sampson	*Echinacea angustifolia*
		Dotted gayfeather	*Liatris punctata*
		Flax	*Linum* sp.
		Sainfoin	*Onobrychis* sp.
	Shrub	Skunkbush sumac	*Rhus trilobata*
		Yucca	*Yucca glauca*

Note: Species proportions would depend on cost and availability.

TABLE F-2
Shrub and Tree Species Proposed
For Drainage Bottom Reclamation

Name	Scientific Name	Percent of Total Planting[1]
American plum	*Prunus americana*	30-60
Chokecherry	*Prunus virginiana*	20-40
Golden currant	*Ribes* sp.	5-10
Hawthorn	*Crataegus columbiana*	5-10
Buffaloberry	*Shepherdia* sp.	0-5
Skunkbush sumac	*Rhus trilobata*	0-5
Box elder	*Acer negundo*	0-5
Green ash	*Fraxinus* sp.	0-5
Cottonwood	*Populus* sp.	0-5
Wood's rose	*Rosa woodsii*	0-5

[1] 1,000 seedlings/acre.

APPENDIX G

Common and Scientific Names of Plant Species Discussed in the Text

Common Name	Scientific Name
Grasses and grasslike	
Western wheatgrass	Agropyron smithii
Penn sedge	Carex pennsylvanica
Neddle-and-thread	Stipa comata
Prairie junegrass	Koeleria cristata
Sideoats grama	Bouteloua curtipendula
Bluebunch wheatgrass	Agropyron spicatum
Little bluestem	Schizachyrium scoparium
Prairie sandreed	Calamovilfa longifolia
Japanese brome	Bromus japonicus
Idaho fescue	Festuca idahoensis
Slough sedge	Carex atherodes
Basin wildrye	Elymus cinerus
Big bluestem	Andropogon geradi
Bluegrass	Poa spp.
Cattail	Typhus spp.
Bulrush	Scirpus spp.
Sedge	Carex spp.
Garrison creeping foxtail	Alopecurus arundinaceus
Forbs	
Western yarrow	Achillea millefolium
Hood's phlox	Phlox hoodii
Broom snakeweed	Xanthocephalum sarothrae
Shrubs and Trees	
Yucca	Yucca glauca
Skunkbush sumac	Rhus trilobata
Silver sage	Artemisia cana
Ponderosa Pine	Pinus ponderosa
Snowberry	Symphoricarpos occidentalis
Rose	Rosa spp.
Hawthorne	Crataegus columbia
Plum	Prunus americana
Chokecherry	Prunus virginiana
Buffaloberry	Shepherdia spp.
Green ash	Fraxinus spp.
Box elder	Acer negundo

APPENDIX H

Biological Assessment of
Threatened and Endangered Species

United States Department of the Interior
OFFICE OF SURFACE MINING
Reclamation and Enforcement
BROOKS TOWERS
1020 15TH STREET
DENVER, COLORADO 80202

April 30, 1984

MEMORANDUM

TO: Wayne Brewster, Field Supervisor
Endangered Species, FWS
Helena, Montana

FROM: Robert Schueneman, Chief Robert Schueneman
Technical Support Branch, OSM
Denver, Colorado

SUBJECT: Biological Assessment, Absaloka Mine, Big Horn County, Montana

Attached is our assessment pursuant to Section 7 of the Endangered Species Act as amended. OSM has concluded that the proposed action will not jeopardize the continued existence of listed species or adversely affect critical habitat.

If you have questions please contact Don Henne at FTS 327-5421.

Attachment

Biological Assessment for the Absaloka Mine pursuant to Section 7 of the Endangered Species Act of 1973 as amended.

Prepared by the Western Technical Center, Office of Surface Mining, Denver, Colorado April 19, 1984

Introduction

In a joint effort with the State of Montana, OSM is preparing an EIS for the proposed expansion of the Absaloka Mine. OSM requested, and the FWS provided on March 29, 1984, a list of protected species which could be present in the mine area. That list consisted of the black-footed ferret (*Mustela nigripes*), bald eagle (*Haliaeetus leucocephalus*) and the peregrine falcon (*Falco peregrinus*). The assessment presented next describes the proposed action and OSM's determination of impacts.

Proposed Action and Background Information

The proposed action is approval for Westmoreland Resources to mine an additional 629 acres adjacent to its existing surface mine in the Big Horn County, Montana. The Absaloka Mine has been in operation since 1974 and is located approximately 26 miles east of Hardin, Montana. The area of proposed disturbance is largely a mixture of grassland, ponderosa pine forest and agricultural lands. However the habitat diversity is increased by the presence of riparian cover, shrublands, springs, seeps and rock outcrops.

Regulatory Compliance and Mitigation Measures

Westmoreland's proposal must comply with the Montana State Program requirements to minimize adverse environmental impacts and protect fish and wildlife resources. Among these requirements is one to reclaim disturbed areas contemporaneously so not all habitats will be disturbed at once. For the proposed action this means that disturbance and reclamation will occur in 50 acre parcels. Wildlife habitat is a post-mining objective and there are specific plans to restore habitat diversity using trees, shrubs, grasses, water sources and land contouring.

Additional requirements beneficial to protected species include proper powerline design to minimize electrocution hazard and notification of regulatory authorities if threatened and endangered species are observed on the site.

Impact Assessment

Black-footed Ferret
Current knowledge about this secretive mustelid indicates a penchant for prairie dog colonies where both food and shelter are obtained. Several years of wildlife study on the Absaloka area documented the presence of one, five-acre, black-tailed prairie dog colony. Original searches of that colony did not produce any evidence of ferret presence or use. OSM has concluded that the proposed action will not affect the black-footed ferret but is prepared to require an updated, state-of-the-art survey of this colony if deemed necessary by the FWS.

Bald Eagle
This raptor migrates through and sometimes winters in this region of Montana. There are no known bald eagle roosts on or near the Absaloka site but these birds have been infrequently observed during the winter. Without any concentrations documented, the probable value of the Absaloka site to bald eagles is one of occassional, opportunistic use by migrating birds. While ponderosa pines suitable for perching will be disturbed, they are not a limiting factor for eagle use of the area. The mitigation previously discussed will restore the premining values of the area for bald eagles. OSM has determined that the proposed action will not affect the bald eagle.

Peregrine Falcon.
This species is listed as a migrant for the Absaloka area and rare sightings of this bird have been recorded by Westmoreland personnel. Any use of the area would be infrequent and by transient falcons and there is no evidence that the habitats provide any sustaining food or shelter crucial to migrants. Disturbances may alter peregrine preferences for perching but perches are not confined to areas scheduled for disturbance. Reclamation plans will restore most premining values though some topographic diversity will be lost. OSM has concluded that the proposed action will not affect the peregrine falcon.

References
OSM and Montana Department of State Lands, 1984, Draft EIS for the Absaloka Mine, in preparation, Denver, Colorado

Westmoreland Resources, 1975-1982, Permit Application Information, Book G, 3 volumes, Denver, Colorado

#4286A

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Chief, Technical Support Branch
Office of Surface Mining, Denver, CO

DATE: May 16, 1984

FROM : Field Supervisor, Endangered Species Field Office, USFWS
Fed. Bldg., 301 S. Park, P.O. Box 10023, Helena, MT 59626

SUBJECT: Absaloka Mine Section 7 Consultation

We have reviewed your biological assessment for approval of the Absaloka Mine expansion. We concur with your determination that the proposed expansion will not affect the black-footed ferret (Mustela nigripes), bald eagle (Haliaeetus leucocephalus), and peregrine falcon (Falco peregrinus), contingent upon black-footed ferret surveys prior to disturbance in prairie dog (Cynomys sp.) and raptor proofing of new or modified powerlines.

You stated that original searches of prairie dog towns did not produce any evidence of ferrets, but that OSM would require updated surveys if deemed necessary by the FWS. Because prairie dog towns are considered potential habitat for ferrets, we believe that it is necessary for all prairie dog towns to be surveyed for ferrets within one year prior to disturbance to ensure that construction activities do not affect ferrets.

Your assessment also mentions the requirement of "proper powerlines design", but does not go into detail. Lines carrying less than 4 kV do not pose an electrocution hazard to large raptors. All lines carrying higher voltages should be raptor proofed according to the recommendations provided in the publication "Suggested Practices for Raptor Protection on Powerlines - The State of the Art in 1981".

We appreciate your efforts to consider and conserve endangered species and their habitats.

Wayne G Brewster

cc: Regional Director, FWS, Region 6, Denver, CO
Ecological Services, FWS, Billings, MT
Montana Division of State Lands, Helena, MT

COMMENTS ON THE DRAFT EIS

-Letters to the Department

-Answers to the Public

The Environmental Analysis Bureau received fifteen letters commenting on the EIS. Starting on the next page, this chapter reproduces each letter in full. None have been omitted. Alongside each letter are DSL and DOI's responses.

LETTER 1

Montana Department of Fish, Wildlife & Parks

July 9, 1984

JUL 11 1984

Mr. Kit Walther
Department of State Lands
Helena, Montana 59620

RE: Comments on Absaloka Mine Draft E.I.S.

Dear Kit:

We have reviewed the Absaloka Mine Draft E.I.S. and have a number of comments to offer.

A From a general perspective, we feel that habitat types should be replaced in a proportion similar to that which existed on the area naturally. This does not appear to be the plan for the ponderosa pine and riparian types. Wildlife abundance and diversity will be sacrificed if these types are not replaced in their original proportion. If this is the case, it will be difficult to meet the intent of the Reclamation Act. The continuation of agricultural crop production as it now exists would also be beneficial to wildlife.

Specific comments are attached.

Sincerely,

Robert R. Martinka
Resource Assessment Unit

RRM/bfs

cc: Pete Martin

A Comment noted thank you.

LETTER 1

May, 1984

COMMENTS ON ABSALOKA MINE DRAFT E.I.S.

Section III - Impacts

VEGETATION:

B **Table III-3 (page III-13) shows a reduction of 47 acres in the Ponderosa Pine Forest type, a 14-acre reduction in Deciduous Tree/Shrub and Riparian type and a 154-acre cropland land reduction.**

The reductions in pine and riparian (tree/shrub) types should be discussed. Further, the agricultural fields could he reclaimed as agricultural fields to increase diversity and enhance food sources for wildlife.

C III-15. "Use of straw mulch,..., poses potential problems."

Why use straw mulch if it causes more problems than it solves?

D III-15. Aquatic Vegetation - "Cattle use may damage developing plants..."

Fences should be built to limit cattle access to a small portion of reconstructed pond shoreline. Cattle need access to the water, but they don't need the whole shoreline!

E III-16. Mitigating Measures.

Ponderosa pine planting rates should be increased in some areas to restore closed-canopy stands. Also, additional acres of open canopy stands should be planted.

Containerized seedlings do seem to survive better. More acres of chokecherry, silver sage, plum, buffalo-berry, rose, snowberry and other deciduous shrubs should be planted (also Russian Olive).

Protective measures for these tubelings must be required.

Clean native hay mulch may be the best.

WILDLIFE:

F III-20. "The simplified mosaic proposed ... would provide lower quality deer habitat"...

This would not seem to meet the requirements of the Reclamation Act. The same number of acres in each habitat type should be found in the post-mining reclamation plan as exists in the pre-mine condition.

G "White-tailed deer: The effects ... would be similar to mule deer."

We disagree with this statement. The white-tailed deer in the area are strongly associated with a particular drainage and its riparian vegetation

B Comment noted. Thank you. Please see page III-13, paragraph 2, sentence 6 and page III-18, last paragraph, sentences 3 and 4. Replacing agricultural land would improve overall wildlife habitat quality on the application area. However, replacement would require selective soil handling. In addition, the future landowners may not choose to maintain cropland for the benefit of wildlife. Therefore, cropland replacement has not been suggested as a mitigating measure.

C The problems listed are potential ones. They would not necessarily occur. Using "clean" straw mulch would reduce the chances of introducing undesirable plants (see page III-16, paragraph 7). In general, mulches protect soil and promote plant establishment. Straw or hay mulch is often more economical and effective in controlling water erosion than are other mulches (Kay, 1980).

D Comment noted. Fences are one method of regulating cattle use of shoreline vegetation. See revised text (Mitigating Measures).

E Your comments are noted. Increasing the acreages of ponderosa pine and deciduous shrubs has been added to the revised list of mitigating measures for wildlife. Note that some species of deciduous trees or shrubs survive better when planted as bare-root stock (Jensen and Hodder, 1979; Orr, 1977). Direct-hauled soil would probably supply a sufficient source for snowberry and rose regeneration.

F Comment noted. Increasing acreages of ponderosa pine and deciduous shrubs would improve the overall quality of deer habitat. (See letter 8, answer RR.) This has been added to the revised list of mitigating measures for wildlife. (See also answer B.)

G The text has been revised to indicate the magnitude of impacts to whitetails. See page II-19, paragraph 3, for a discussion of habitat use.

LETTER 1

and nearby agricultural lands. The 50% reduction in the deciduous shrub type and complete elimination of agricultural lands will have a significant negative effect on the resident white-tailed deer population.

H Upland game birds - III-20. "The elimination of agricultural lands would reduce quality habitat."

III-21. "The acreage of woody cover would be permanently reduced."

The first statement is true. Therefore, some agricultural lands should be included in the reclamation plan. The second statement indicates possible non-compliance with the Reclamation Act. Shrubs are extremely important to upland birds for thermal cover and food sources.

I Waterfowl - III-21.

"Loss of most vegetation around ponds...eliminate...production."

This could be remedied by building a fence around the pond leaving a water-gap for access by livestock.

J III-22. Life of mine impacts.

"Mining would gradually force big game animals from the life-of-mine area."

This may not be a fair statement. There will be big game usage of the area. Depending upon what reclamation techniques and vegetation mixtures are achieved, various species will react accordingly.

K "Reclamation plans have not been developed."

This should be accomplished as soon as possible and we (DFW&P) should be actively involved.

L III-22. Mitigating measures:

More and larger areas should be subjected to increased ponderosa pine planting rates. More acres of open canopy pine should also be planted.

More acres of shrub/tree types should be planted for both big game and upland bird species.

Reconstructed ponds should have their shorelines fenced to limit cattle and other livestock access, yet allowing them watering opportunity.

H Your comments are noted. See answers B and E. The importance of shrubs to upland game birds is discussed in letter 8, answer SS, and on page II-21.

I Comment noted. See answer D.

J The statement considers only the effects during mining, not after reclamation. Mining would have a similar effect in the application area (page III-20, paragraph 2, of the draft).

K The Department of State Lands can only require a reclamation plan for the application area. Note that Westmoreland has sought MDFWP's comments in the past on revegetation and wildlife plans (Westmoreland Resources, 1983, ex. G-6).

L Although deer habitat can be improved by providing some closed-canopy forest, extensive areas would not be beneficial. See also answers D and E.

LETTER 2

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Ecological Services
Federal Building, Room 3035
316 North 26th Street
Billings, Montana 59101-1396

JUL 20 1984

IN REPLY REFER TO:
ES

July 19, 1984

"Westmoreland Resources," Absaloka Mine

Mr. Kit Walther
Department of State Lands
Capitol Station
1625 Eleventh Avenue
Helena, MT 59620

Dear Mr. Walther:

We have reviewed the DEIS entitled "Westmoreland Resources', Absaloka Mine, Revised Plan, Big Horn County, Montana. The document was prepared in order to meet OSL's requirements under the Montana Environmental Policy Act and OSM's requirements under the National Environmental Policy Act.

A We note the statement concludes that the proposed action would not affect the occasional bald eagle or peregrine falcon migrating through the area. The statement does not indicate whether or not this conclusion was reached as a part of the biological assessment process required of Federal agencies by Section 7(c) of the Endangered Species Act, as amended. The FEIS should reference this process and the conclusions reached.

B The DEIS also documents that a great horned owl nest will be destroyed during development of the 13-year plan and that an additional red-tailed hawk nest will be removed during the life of the mine. These species and their habitats are regulated by the Migratory Bird Treaty Act. Compliance with this act will require that a special purpose permit be obtained from the U.S. Fish and Wildlife Service prior to disturbance of the protected raptor nests.

Sincerely,

John G. Wood
Field Supervisor
Ecological Services

A The biological assessment proceaa ia referenced in the reviaed text.

B Thank you for thia information.

LETTER 2

cc: OSM, Denver, CO
Regional Director, USFWS, Denver, CO (HR)
Michael Mitchell, Westmoreland Resources, Hardin, MT
Director, Montana Oepartment of Fish, Wildlife, and Parks
Helena, MT
Field Supervisor, USFWS, Helena, MT (SE)

LETTER 3

DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of the
Regional Director

Region VIII
Federal Office Building
1961 Stout Street
Denver CO 80294

July 9, 1984

Mr. Kit Walther
Environmental Analysis Bureau
Montana Department of State Lands
Capitol Station
Helena, Montana 19620

Dear Mr. Walther:

We hve reviewed the Draft Environmental Impact Statement (EIS) Absaloka Mine, Big Horn County Montana.

The Draft EIS does not address the social services the Office of Human Development Services is involved with, i.e., Head Start, Child Welfare Services, and services for the elderly and therefore cannot be evaluated. Information on the type of social services needed and provided as well as the source of funding would be useful in reviewing the plan.

Sincerely,

E.W. McIntire
Contracting Officer

Big Horn County provides child welfare services and services for the elderly; however, the county does not have a head start program. Big Horn County's population would increase very little under the application plan, since the company intends to hire Crow Indiana for any new or additional jobs. Due to the ongoing assimilation of current mine employees and the company's commitment to hire Crow workers, social conditions would remain relatively unchanged if the application is approved. Note (chapter III, Social and Community Services) that less than 4 percent of the forecasted population of Big Horn County reaults from immigrants supported directly or indirectly by the mine. Any increases necessary in social and community services would stem from natural population increases.

LETTER 4

MONTANA HISTORICAL SOCIETY
HISTORIC PRESERVATION OFFICE
225 NORTH ROBERTS STREET • (406) 444-4584 • HELENA, MONTANA 59620

JUL 19 1984

July 18, 1984

Mr. Kit Walther
Environmental Analysis Bureau
Montana Dept. of State Lands
1625 Eleventh Avenue
Helena, MT 59620

Dear Mr. Walther

This is to acknowledge receipt of the draft Environmental Impact Statement for Westmoreland Resources' Absaloka Mine revised plan, Big Horn County, Montana. We find the plan to have adequately addressed cultural resource concerns and have no further comment.

Please call if you have any questions regarding this matter.

Sincerely,

Alan Stanfill

Alan L. Stanfill,
Archaeologist/Anthropologist

Thank you for reviewing the document.

LETTER 5

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

TED SCHWINDEN, GOVERNOR — STATE OF MONTANA — COGSWELL BUILDING

HELENA, MONTANA 59620

July 30, 1984

Kit Walther
Environmental Analysis Bureau
Department of State Lands
Capitol Station
Helena, MT 59601

Dear Kit:

The Montana Department of Health and Environmental Sciences reviewed the draft environmental impact statement (EIS) on the Absaloka Mine in Big Horn County and has two comments concerning water quality:

A 1) Page II-37: DHES information indicates that it's unlikely that Harden's water treatment plant is large enough to accommodate 27,000 persons.

B 2) Page II-38: The following part of the first sentence should be crossed out, "...and an activated sludge plant."

If you have any questions, call.

Sincerely,

Tom Ellerhoff

A Your comment is noted. The text has been changed.

B Your comment is noted. The text has been revised.

LETTER 6

919 W. Silver
Butte, MT 59701
July 31, 1984

Environmental Analysis Bureau
Department of State Lands
Helena, Montana 59620

RE: Westmoreland Revised Plan Draft EIS

Hearing Officers:

My name is Dan Heinz. I am presenting testimony on behalf of the Montana Chapter of the Sierra Club. Let me first make it clear that it is not our intent to oppose continued operation of the Absaloka Mine when it reaches the current permit boundary. We are looking for an alternative which allows the continued production of coal while providing assurance the land will be left aesthetically pleasing as well as productive for wildlife and agriculture.

Our concern focuses on the North Couloe and the cluster of perennial springs and seeps in this area. North Coulee is uniquely productive for many wildlife species.

It seems to be an obvious alternative to mine around this drainage and leave this peninsula of unique habitat intact. This will buffer the tame pasture affect that revegetation of the mined area will produce.

A There is no alternative developed in your draft EIS which analyzes this approach. The only alternatives you present are polarized "go and no-go" options. This does not leave us any analysis of the middle-of-the-road opportunities.

I recently retired from a career of 25 years with the U.S. Forest Service. I have had some experience preparing development alternatives for large tracts of timber land. We often found that leaving areas of marginally commercial timber intact provided good mitigation for wildlife while increasing profitability of the

A Please refer to new text prepared for the final EIS (chapter IV). The effects on the physical and socioeconomic environment have been analyzed for two levels of selective rejection.

LETTER 6

PAGE 2

operation.

B It would seem that the burned out coal seams under North Coulee would place these lands in a marginally profitable status. If so, what an excellent opportunity to buffer and mitigate the adverse effects of mining while continuing to extract coal. In any event, an exchange of coal royalties between the Crow Tribe and BLM could protect North Coulee while providing for Crow Tribal royalty needs.

The environmental analysis process will not operate unless an array of alternatives is honestly developed. Indeed, the law requires a full array be displayed. Please provide us some modest alternatives to the extremes presented so far. We can then analyze these alternatives and participate positively in the permit process. We are looking forward to reviewing your revised draft EIS.

Sincerely yours,

Dan Heinz
Executive Committee
Montana Chapter
The Sierra Club

B The Robinson coal seam, which is the lower of the two seams now being mined, underlies North Coulee and is not burned out, as is the Rosebud-McKay seam. Westmoreland Resources believes it can economically recover the Robinson coal from the North Coulee.

In regard to royalties, see letter 7, answers L, CCC, and DDD.

LETTER 7

P. O. Box 882
Billings, MT 59103
August 1, 1984

Environmental Analysis Bureau
Att: Mr. Kit Walther
Department of State Lands
Capitol Station
Helena, MT 59620

RECEIVED
AUG 0 2 1984
STATE LANDS

RE: Westmoreland Resources' Absaloka Mine Revised Plan DEIS

Dear Mr. Walther:

Following our discussion at the July 31st public hearing in Hardin, enclosed is the original typing of my comments as submitted in copy at that time.

A By this cover letter I hope to re-emphasize the potential importance of the Davenport letter appended to my comments. By the Davenport letter, the Department of Interior holds incomplete the 20-year mine plan EIS of 1977. As a companion to the 20-year EIS, Interior issued a Westmoreland lease EIS, commonly referred to as the Tract III EIS. Both EISs were issued pursuant to adjudication of Cady v. Morton, in which I was a plaintiff.

Does the absence of any discussion in the present DEIS of alternative mining plans which would (1) allow continued mining, (2) provide continuing royalties to the Crow Tribe, and (3) exclude from mining the North Coulee springs reflect a decision that the North Coulee springs mine application must be considered out of context with other Tract III strippable reserves?

B Is it the position of the Montana Department of State Lands and the U. S. Department of the Interior that neither agency may suggest or require consideration of alternative mining plans, either five-year plans, twenty-year plans, or life-of-mine plans, within the context of the Tract III lease?

C I hereby repeat my July 31st request that responses to DEIS comments be circulated in the form of a revised draft EIS. Please enter this cover letter as part of my comments on the present DEIS. Do not hesitate to call upon me for clarification or extrapolation of my comments, and please open your decision-making process so that the public is neither surprised by your future actions nor precluded from participation.

Sincerely yours,

Edward M. Dobson

Edward M. Dobson

A There are reasonable alternatives within the life-of-mine area that would allow for mining around the applicstion area. Two options are addressed in the final EIS which would allow access to reserves east of North Coulee.

B Neither the federal nor state strip mine laws give the agencies authority to require a company to provide alternative mining and reclamation plans. However, the agencies may consider and suggest alternatives.

The agencies cannot reasonably predict, due to the many factors that must be considered in preparing a mining and reclamation plan (i.e., economic, engineering, and reclamation), which areas (specifically, disturbance areas) would be mined as alternatives to the proposal. To do so would be to second-guess Westmorelsnd. Should the proposal be rejected, the company alone would decide how to reapply for alternstive mining permits thst would hypass the North Coulee. These new permit applications would be subject to a new evaluation hy the sgencies.

C See letter 7a, answer SSS.

LETTER 7a

Dobson Comments, Absaloka ne Revised Plan DEIS of May, 1 July 31, 1984

A I. In order to assure continuity of the record, by this reference all comments I have submitted on previous impact statements concerning the Absaloka Mine are hereby resubmitted as though offered in their entirety at this time.

B II-1. How will Westmoreland's acquisition of this new permit affect the bargaining position of the Crow Tribe as both parties enter into negotiations on the renewal of the Tract III lease?

C II-2. How will the proposed mine plan be affected if the Crow Tribe requires Westmoreland to set aside for Tribal use the coal presently being dumped into the overburden spoil pile?

D III-1. Where in the proposed mine area, precisely, will Westmoreland be recovering only the Robinson seam?

E III-2. How deep is the next coal seam - thicker than five feet - below the Robinson seam in the proposed permit area, and how thick is it?

F IV-1. What expertise has DSL relied upon in verifying Westmoreland's contention that the Section 31 ridge cannot profitably be mined?

G IV-2. How does the Coal Conservation Act apply to the Section 31 ridge and III-2 above?

H IV-3. Has overburden averaging or any other technique been examined to allow mining of the presently omitted Section 31 ridge?

I IV-4. Why has the mining of Section 31 ridge not been analyzed as an alternative in the present DEIS?

J IV-5. Will Westmoreland's present intention not to mine the Section 31 ridge change as did their defunct intention to mine all of permit area 80005 as an integral area in a five-year plan?

K IV-6. When was the Crow Tribe notified that Crow coal under Section 31 ridge would be left virtually surrounded by mined land, effectively precluding future recovery?

L IV-7. If Section 31 ridge is left unmined and lost to future recovery as an isolated tract, OSM and BIA should use the exchange provisions of FLPMA and SMCRA to exchange the ridge coal for federal coal currently being mined, perhaps at Colstrip, to provide royalty to the Crow Tribe. This would be reasonable compensation for allowing mining of adjacent coal, thereby eliminating the economic mining unit, during this time of soft coal market when a stronger market might provide complete recoverability. Has this alternative been developed?

M IV-8. Is it possible to extend Section 36 (permit 78005) cuts immediately into Sections 31, 3, and 4 rather than creating the strange future recovery scheme shown in Figure I-2?

N IV-9. Why is the immediately preceding option not subjected to unbiased analysis and presented as an alternative in the present EIS?

O V-1. Drier climatic conditions are said (DEIS, p. II-4) to be responsible for declining spring discharge since 1979. What were the comparative conditions of Springs 260 and 12 at the time of the 1977 USGS EIS, and what are their comparative conditions now?

A The agencies have responded to all your previous comments in earlier EISs and have considered these comments in this analysis.

B No relationship exists between the pending permit application decision and the royalty negotiations of the Crow Tribe and Westmoreland Resources. Such an analysis is beyond the scope of this EIS.

C Westmoreland is allowed to spoil portions of the stray 1 and 2 seams that are unsuitable in quality. Westmoreland recovers the marketable portions of these seams. There would be no significant effect on the proposed plan if the Crow Tribe required Westmoreland to set aside for tribal use the unmarketable coal that is spoiled.

D The Rosebud-McKay and Robinson coal seams would be mined to the Rosebud-McKay burn line, shown in figures IV-1 and IV-2. Only the Robinson coal would be mined within the part of the North Coulee drainage where the Rosebud-McKay coal has been burned or eroded away. The burn line is also shown in figure I-2, although it is not labeled. A more detailed description is contained in the permit application.

E Based on exploratory drilling records, no recoverable coal seams lie in the application area below the Robinson seam to a depth of approximately 600 feet. Drill logs for exploration holes west of the application area reveal an unnamed coal seam approximately 5 feet thick at an elevation of about 3,800 feet. The thickness and depth of this coal seam varies.

F Evaluating Westmoreland's position that the section 31 ridge cannot be profitably mined under current economic conditions is not warranted at this time, since the pending application decision would not affect future recovery of coal from the ridge. Westmoreland's life-of-mine plan provides sufficient opportunities for including mining of the section 31 ridge in the future.

G The coal conservation provision of the Montana Strip and Underground Mine Reclamation Act (prior to 1979 known as the Strip Mined Coal Conservation Act) does not apply to the section 31 ridge at this time. There are no economically recoverable coal seams below the Robinson seam, and Westmoreland's life-of-mine plan retains options for mining the ridge in the future. The section 31 ridge can be included in future mining plans when adjacent areas are considered for mining.

H DSL has not examined overburden averaging for section 31. Westmoreland's life-of-mine plan retains the option for averaging high and low overburden ratios so that recovery of coal under the ridge is not jeopardized. Westmoreland's pending application would not affect future recovery of coal under the section 31 ridge. It merely delays recovery until economic conditions improve.

I The alternatives evaluated in the final EIS consider the application area only. (See chapter IV.) The application does not include the section 31 ridge and therefore such an analysis would be beyond the scope of this EIS.

J Westmoreland intends to mine the ridge if economic conditions permit (Dave Simpson, pers. commun., August 15, 1984). Regulatory requirements of state and federal strip mine laws, environmental considerations, and economic conditions will determine if, and when, the ridge will be mined.

LETTER 7a

Dobson comments, page 2

P V-2. Does the present condition of Spring 260 reinforce or defeat the contention that all of the perennial springs in North Coulee occur in the headwaters tributaries?

Q V-3. What is the significance of the ebsence of springs in the lower tributaries of North Coulee, especially perennial springs, where similar stretigrephic conditions exist?

R V-4. How does the present condition of Spring 260, reletive to its condition in 1977, reflect upon the importance and perennial nature of higher springs such ae 4, 5 (261), 8, 11, 12, and even 6?

S V-5. What is the source of water for the pipe exposed at the county road where Spring 5 (not Spring 261) is located? How long is that plastic pipe and how is it fed?

T V-6. Table II-3 identifies Spring 5 as Spring 261 (stock tank) and vice-verse. This is confusing. Spring 261 is clearly perennial, but it needs cleaning or a new pipe.

U V-7. Table II-3 identifies Spring 4 as above the washed out impoundment structure, but Spring 4's perennial discharge is below the structure, as we observed on the July 19th tour.

V V-8. Table II-3 identifies Spring 11 as being dry in August, 1983. This is an error in observation, probably caused by observing the headcut above the spring. Spring 11 is a perennial spring showing open water even in the dead of winter, as I have indicated in a previous sworn statement.

W V-9. Given the observation of perennial and intermittent springs on the July 19th tour, will Springs 4, 5, 261, 8, 11, and 12 finally receive proper recognition as perennial? Only Spring 5 might be subject to further observation.

X V-10. What is the present status of Spring 6? If, as suspected, Spring 6 remains et its historic condition and level of discharge despite the proximity of mining, can it be said that maintaining a similar distance in mining above Springs 4 and 11 will save all of the perennial springs? Why has this alternative, which might allow considerable mining in Spring 13 coulee, not been developed?

Y V-11. "Available data" referred to in paragraph 3, p. III-6, apparently ignore the fact that impoundments in North Coulee tributaries historically held little or no water, thus forcing reliance upon springs. Why is this not recognized?

Z V-12. Contrary to the statement on probable function of impoundments, Geology Summary, p. II-55, since impoundments have never proved successful in the North Coulee drainage (thus necessitating reliance upon springs as observed on the July 19th tour), and assuming similar evaporation rates after reclamation, why is there any reason to suggest that impoundments would serve to replace perennial springs lost to mining? Expensive and extensive Sub-Robinson pumping would be necessary.

AA V-13. Increased sediment loads mentioned at p. III-2 would silt in impoundments. How fast? Recent North Coulee dams are built above springs to prevent siltation. (Sp. 8, 11, 12

BB V-14. The longshot after-mining speculation of an intermittent spring at the present site of Spring 12 cannot justify the mining and destruction of the perennial springs of North Coulee, can it? Certainly the wish list in the paragraph overlapping pages III-7 and -8 cannot.

CC V-15. Can the poor production of the test windmill between Springs 7 and 11, as observed on the July 19th tour, justify destruction of perennial springs? That windmill has a terrible time getting water to the surface, and in many observations I have only seen it produce a little water, and then only at sustained high RPM. It fails as a stock source. The Sub-Robinson seems to be a fragile, political diversion.

K Westmoreland submits copies of its application to the Bureau of Indian Affairs and Bureau of Land Management when formally applying for approvals from OSM and DSL. The tribe presumably learned of Westmoreland's life-of-mine plan once the application was submitted to these agencies. Note that the life-of-mine plan does not prevent future recovery of the coal under the ridge. Furthermore, Westmoreland's life-of-mine plan is not the subject of approval by OSM and DSL. The life-of-mine plan represents anticipated mining in the foreseeable future and is used for the purposes of cumulative impact assessment.

L The law and rules governing federal coal lease exchanges does not allow the exchange of economically and environmentally recoverable federal coal for coal that is not economically recoverable. Federal coal leasing rules and regulations have no provisions to subsidize the owners of uneconomic coal deposits by the transfer of leases for mineable federal coal deposits.

M Yes, it is possible.

N See answer 1.

O Spring flows in the North Coulee area were not regularly recorded before 1979. The discharge values in the 1977 USGS EIS were 1 gpm for spring 260 and less than 0.1 gpm for spring 12. These measurements come from a single sampling, insufficient to compare with spring discharge data collected at later dates. However, in April 1980 spring 260 had a measured discharge of 5.8 gpm, while spring 12 had a discharge of 18 gpm. See also table II-2.

P According to spring discharge monitoring records submitted by Westmoreland, spring 260 is not perennial.

Q The lack of springa you refer to may stem from several hydrogeologic phenomena. The stratigraphy of the upper part of North Coulee does differ from the lower part. The lithology changes from Rosebud-McKay overburden strata to clinker deposits to units overlying the Robinson coal. Theae changes in rock type cause variations in hydrogeologic characteristica such as permeability and storage coefficienta. Apparently the rock types in the lower tributariea of North Coulee are not conducive to the surface expression of ground water movement.

R Spring 260, like springs 4, 5, and 11, ia not perennial. Changes in alluvial spring discharge rates aince 1977 throughout the North Coulee area are explained by drier climatic conditions over the past 7 years. See also answer O.

S The pipe at spring 5 ia an attempted development for flow measurement. The coulee fill waa excavated to bedrock, a plastic barrier was placed on the downstream end of the excavation, and the excavation was fitted with a perforated pipe and filled with gravel. Although some water flows through the pipe, this development has not been entirely succeaaful. The pipe is perhaps 30 feet long.

T See letter 8, anawer H.

LETTER 7a

U DSL's consultant observed in November, 1979, that spring 4 discharged above the breached impoundment. It may be that you observed the site where Westmoreland monitors the flow, rather than where it actually discharges.

V Spring 11 was dry in August, 1983, at the "ponds" below the point of discharge. However, given that 1983 precipitation was several inches below average, this is not surprising.

W Only Springs 5, 8, and 12 are considered perennial. Please refer to table II-3. The other springs are seasonal--they apparently only flow during the wet part of the year.

X Westmoreland reports that the site of spring 6 was dry on July 19, 1984. Impacts to springs in the application area cannot be extrapolated from spring 6. Each spring has its own controlling hydrogeologic characteristics that require individual evaluation.

Y Impoundments in North Coulee tributaries have held very little water in the past because of the nature of the soils and geology in the area. Clinker soils along the tributary coulees' margins tend to intercept and allow infiltration of overland flow, reducing surface flows to the coulee bottoms. In addition, coulee bottom soils are quite permeable, resulting in seepage losses of runoff water.

Excavated impoundments at springs 8 and 12 hold water well owing to the relatively impermeable clay layer underlying these sites. Because runoff may increase after mining, due to the disturbance of clinker deposits in the drainage, properly designed postmining impoundments would probably be functional. Westmoreland has committed to compacting the underlying sediments if necessary to achieve the appropriate limiting permeabilities. The primary postmining impoundment (pond 20) would be constructed on the same clay layer that underlies the excavation at spring 12.

Z See answer Y.

AA Without regular upkeep, the impoundments could be rendered inoperative by sediment deposition within 100 years. (See page III-6.)

By recent North Coulee dams, we assume you are referring to historic stock impoundments in the North Coulee drainage. We don't believe the impoundments were constructed above springs to prevent impoundment siltation. Instead their location was based primarily on areal need of water.

BB The agencies application decision will be made in accordance with the provisions of the state and federal surface mine acts and rules which address protection of the hydrologic balance.

LETTER 7a

Dobson comments, page 3

DD V-16. Coulee bottom soils would best be salvaged in sod blocks, but the reclamation water regime would not sustain the good life to which these North Coulee bottom soils have become accustomed. See p. III-9, Soils Summary. For example the white violets, probably Canadensis, would not survive, nor would Woodland Star, both found in upper North Coulee within the proposed permit area.

EE V-17. The reference on p. II-19 to fawn:doe ratios reflects the high quality habitat. To what extent does the noted decline reflect an impact of mining?

FF V-18. Would protection of the North Coulee perennial springs and their associated habitat provide a base for continued wildlife success during and after mining adjacent land?

GG VI-1. Is it the DSL position that a five-year term EIS is a valid instrument because, inter alia, no permit issued thereunder predetermines or predestines - inadvertently or by design, the mining of any other land?

HH VI-2. Must it not follow, under the above test, that no land beyond land considered in an EIS and subject to its contingent permit is predestined or predetermined to be mined or indispensible to future mining?

II VI-3. Have either or any of the existing Westmoreland permits, principally 78005 and 80005, been amended so as either to predestine or preclude lands for future mining?

JJ VI-4. Why was Westmoreland's reluctance to mine the southern half of permit area 80005 not foreseen by the DSL at the issuace of permit 80005?

KK VI-5. Does the southern quarter of permit area 80005 allow continuous mining access to strippable reserves east of the perennial springs of North Coulee?

LL VI-6. Would it be possible to mine in an easterly direction from the easternmost extension of permit area 80005 and bypass the perennial springs of North Coulee?

MM VI-7. Why has the preceding suggestion not been fully analyzed as an alternative under MEPA and NEPA?

NN VI-8. Are OSM and DSL aware that the EPA and USGS, in finalizing the 1977 20-Year EIS, transfered full NEPA responsibility to DSL in this matter? Refer to response to Dobson comments on 1977 FES and Davenport letter, attached.

OO VI-9. Would earlier access to coal east of the North Coulee springs provide a more favorable overburden to coal ratio? Please provide full analysis.

PP VI-10. Would such a more favorable stripping ratio allow more reasonable consideration of overburden averaging and mining of the Section 31 ridge?

QQ VI-11. DSL procedures have been used by Westmoreland to acquire a permit (80005) that Westmoreland now declares is not mineable without another permit, conveniently in the most controversial area. Can this really be coincidental? Why does there seem to be so much resistance to discussing and adopting an alternative which would protect the perennial springs of North Coulee?

RR VI-12. Why does Figure I-2 show a 1995 completion date extending far east of the county road, an area that could be mined alternatively to North Coulee springs, while Figure I-1 shows not even the county road being affected before the year 2000, the very year which Figure I-2 shows mining nearing the Tract III eastern boundary?

SS VI-13. Exactly what lands will be exempt from further EIS analysis after the May 1984 Westmoreland DEIS is finalized and the contingent permit issued?

CC Data collected on the test windmill suggest that the volume of water produced is insufficient to support the area's stock population. This contention alone indicates that windmills are insufficient to replace destroyed springs. The failure of the windmill in providing an adequate stock water supply does not preclude the use of the Sub-Robinson aquifer as an alternative to spring water supply. Tests conducted on the Sub-Robinson aquifer indicate that wells completed in the unit should produce 5 gpm on a sustained basis (Hydrometrics, 1982). The quantity of water required (300-500 gpd) could therefore be easily supplied by a submersible electric pump in the well. Use of submersible pumps is common on ranches in the area.

DD It is unnecessary to salvage coulee bottom soils in sod blocks because the postmining coulee bottom slopes would average less than 3 percent, and major soil loss is not indicated. In addition, coulee bottom soils would be direct-hauled to recontoured coulee bottoms in reclamation areas. At the Absaloka Mine, this has resulted in volunteer regeneration of native species, many of which are not available commercially.

Although the postmining soil moisture regime would probably change somewhat, we do not believe that this change would significantly affect postmining vegetation. The summary you refer to on page III-9 does not appear to apply to your comment. It is conceivable that Canada white violet (Viola canadensis) and woodland star (Lithophragma spp.) could appear in the reclaimed coulee bottoms, possibly from seed transported in the direct-hauled coulee-bottom soils. However, woodland star (Lithophragma spp.) was not found during any of the baseline inventories at the Absaloka Mine.

EE It is highly unlikely that habitat change and mining activity have significantly affected Tract III fawn:doe ratios. Only 8 percent of Tract III, none identified as critical habitat, has been altered by mining (table II-6). Note that despite the initiation of mining in 1974, ratios climbed to a peak in 1978. The 1979-1982 trends in ratios generally correspond with trends throughout the Montana Department of Fish, Wildlife and Park's Region 7 (Youmans, 1983), suggesting that other factors were at work in southeast Montana.

FF See revised chapter IV.

GG The EIS analyzes the impacts of thirteen years of mining as proposed by Westmoreland's application No. 00114. It is not a five-year term EIS. Also analyzed, to the extent possible, is Westmoreland's life-of-mine plan (anticipated mining). The life-of-mine plan conceptually describes the sequence of mining at the Absaloka Mine beyond the proposed 13-year plan. The application area is a part of that progression by design. Westmoreland's application area does not commit any different lands for mining than are already described in the life-of-mine plan. Furthermore, before mining beyond the 13-year application area could occur, Westmoreland would have to submit detailed mining and reclamation plans that demonstrate compliance with state and federal surface mine laws.

LETTER 7a

HH Westmoreland's life-of-mine plan presents a logical sequence of mining for the foreseeable future based on today's coal economics. There is no reason to believe that the plan would make adjacent lands indispensible to future mining simply because the adjacent lands would be an extension of existing mining. Future national coal demand and coal economics will serve in the future, just as they are today, to influence the rate and progression of mining. These are uncertainties that cannot be accurately foreseen.

II Amendments to 78005R and 80005 do not predestine or preclude future recovery of coal from the areas withdrawn from mining. The single-seam Robinson coal in the southern portion of section 36 (permit 78005R) can be mined along with adjacent reserves in sections 4 and 5, T1S, R38E. This area represents a mineable block of coal that can be recovered over the long term. The portion of pits eliminated from permit 80005 south of the fault can be mined when the high overburden ridge becomes economically feasible for mining.

JJ It was not until after permitting of 80005 that the fault (fig. I-2) in sections 25 and 30 was uncovered and the extent of displacement known. Because of the short cuts south of the fault and the necessity to build ramps down to mine coal, the recovery of Robinson coal south of the fault would have been significantly limited. For this reason, the cuts south of the fault (far less than half the area) were deleted from the 80005 mine plan.

KK Yes, reserves east of North Coulee could be reached in this manner.

LL Yes, mining could progress eastward as you suggest.

MM The analysis in chapter IV has been expanded in response to your comment.

NN Federal agency responsibilities under the National Environmental Policy Act (NEPA) cannot be delegated to states. The letter you reference (Davenport) and the responses in the 1977 final EIS only clarify the federal and state responsibilities regarding determination of lands meeting the critical, fragile, and unique characteristics of the Montana Strip and Underground Mine Reclamation Act. The letter states that this is the responsibility of the Montana Department of State Lands and not that of the Department of the Interior. The federal surface mining act provides no similar provision and, therefore, the delineation of critical, fragile, and unique areas is the responsibility of DSL.

OO Stripping ratios east of North Coulee are similar to those in the application area.

PP Because overburden ratios east of North Coulee are similar to those in the application area, the constraints to mining the section 31 ridge would remain the same.

QQ Alternatives to mining the North Coulee drainage are examined in chapter IV. Department of State Lands procedures are consistent for all mine permits. Additional permits are always required to proceed to adjacent mine blocks when a given block of permitted coal is mined out.

RR Please refer to page I-1, last paragraph.

LETTER 7a

Dobson comments, Page 4

TT VII-1. In July, 1982, I submitted sworn testimony concerning the North Coulee springs to the Minnesota Public Service Commission in the matter of coal supply to Sherco III. My testimony was offered to protect the North Coulee springs as an integral part of the East Fork Sarpy Basin in the belief that Westmoreland could meet its outstanding contractual delivery obligations by mining in the Middle Fork drainage and that Crow Tribal royalties could accrue through a larger exchange than mentioned here (see comments IV-7 above and VIII-3 below). Will this lay to rest Westmoreland's paranoid claims that I want to shut down their mine?

UU VII-2. To what extent has logging in part of the proposed permit area influenced DSL's disposition toward issuance of the permit?

VV VII-3. Are local businesses such as The Wildflower Company of Billings helpful in providing seed for regeneration of forbs? Through such companies can the requisite seed mix be expanded?

WW VII-4. Is the coal being mined under permit 78005 lower in sulphur than coal being mined under permit 80005, or is it of better quality in any aspect?

XX VII-5. Has any coal user indicated a preference for permit 78005 coal?

YY VII-6. Monitor weirs installed in North Coulee tributaries apparently have been little more useful that Bureau of Reclamation's Anchor Dam west of Thermopolis, which won't fill up. Has a reasonable formula for measuring spring flow been developed, for example using evaporation and seepage rates, so that we can dispense with the obfuscatory "no flow" reports continuously turned in on perennial springs?

ZZ VII-7. In the July 21st Billings Gazette (attached copy) Crow Tribal Chairman Donald Stewart "called water the most important God-given resource." How will his view affect the proposed destruction of the perennial springs of North Coulee?

AAA VIII-1. Chapter IV does not describe alternatives that allow mining to continue while selectively denying that part of the application necessary to protect the perennial springs of North Coulee, and therefore the DEIS is deficient as a matter of law.

BBB VIII-2. Whether the complex of perenniel springs in upper North Coulee is unique can only be resolved by the identification of a similar area, thus demonstrating that the North Coulee complex of six perennial springs, one of which (Sp. 6) is under permit 80005, is not unique, not without like or equal. While the township reference on p. II-6 is a specious generalization, it implies that the author has sufficient knowledge of the townships to identify at least one similar area of five or more perennial springs concentrated within about one square mile. Please identify one such area so that it may be examined. If no such area is identifiable, the North Coulee perennial spring complex is unique as a matter of law.

CCC VIII-3. FLPMA and SMCRA exchange provisions are available where hydrology is invoked to prohibit mining. For the benefit of the Crow Tribe, has this alternative been developed?

DDD VIII-4. An exchange of coal reserves would allow the Crow Tribe to receive royalties from exchanged coal on top of royalties received from the continuation of actual mining, thus providing double royalties to the Crow Tribe for a time. Has this possibility been discussed with the Crow Tribe? How would local economics be affected?

EEE VIII-5. Since Spring 6 is virtually on the outer boundary of permit area 80005, and since Westmoreland has revised their mine plan to delay mining of the south half of permit area 80005, I request that DSL consider and adopt an alternative that will protect Spring 6 and include Spring 6 with the other perennial springs of North Coulce in a selective denial of the mining application.

SS The agencies do not know if subsequent applications to mine other parts of Westmoreland's life-of-mine plan would require the preparation of an EIS. Such decisions cannot be made until after an application is submitted and the agencies determine that a decision on the proposal would significantly affect the quality of human environment. No proposals to mine are exempt from the decision process.

TT Your question would best be directed to Westmoreland.

UU Rights to timber in the application area are owned by an individual not affiliated with Westmoreland Resources. The area is sporadically logged, although the amount harvested is unkoown. This logging will not influence the permit decision.

VV Proposed seed mixtures (app. E and F) comply with DSL regulations (ARM 26.4.315(5)). Their effect on postmining plant diversity and a suggested mitigating measure are discussed in chapter III, Vegetation. DSL neither regulates nor advises on sources for seed mixtures.

WW The sulfur content of coal is reasonably uniform throughout the Tract III lease. Section 36 (and the North Coulee area) includes large reserves of low-sodium Rosebud-McKay coal, which is desirable for some existing boilers.

XX See answer WW.

YY The nature of most springs in North Coulee makes accurate measurement extremely difficult, if not impossible. The use of a formula based on evapotranspiration or seepage would be difficult to calibrate and of questionable accuracy.

ZZ Mr. Stewart's view will be considered in our analysis along with the views of all other people who comment on the EIS.

AAA Please refer to chapter IV, which now includes two options for selectively rejecting approval of mining the North Coulee drainage.

BBB The report referenced on page II-6 was prepared for Westmoreland in 1977 and was presented by the company in at least its last two permit applications. As such, it has been available for public review for about seven years. We have no reason to doubt it's authenticity or accuracy, but are always willing to evaluate new information.

Tables 1 and 2 and appendix A of the referenced document list numerous townships in southeastern Montana where there exists a density of springs equal to or greater than the density in North Coulee.

Westmoreland also suggests that exhibit I-2, plate 2.2-3.2 (Spring Inventory) shows several areas in the Tract III vicinity where spring concentrations are comparable to those in the permit application area.

LETTER 7a

CCC Coal exchanges are undertaken to benefit owners of coal that caonot be mined due to environmental coostraiota. The Crow would be respoosible for requesting a coal exchange if the North Coulee area were to be determined to be unsuitable. Such exchaoges require Coogressional authorization, unleaa the area has been determined to be an alluvial valley floor, in which case the Secretary of DOI can authorize the exchange (43CFR3435.2(b)).

The area could be determined to be unsuitable in one of two ways. The Crow or other persons could petitioo for a determination that the area is unsuitable to mine or the mining permit issued by DSL could selectively deoy mining io portions of the North Coulee. Until one of theae actiona occurs, a coal exchange is not possible.

DDD As noted in the previous anawer, the North Coulee area has oot been determined to meet unsuitability criteria aod, therefore, an exchange for federsl coal is not poasible. However, even if a coal lease exchange were to be authorized by Congress, the total amouot of royalties received by the tribe would not double. Coal exchange provisions require that exchanged coal be of equal fair market value (43CFR3435.3-4), therefore, the tribe would receive royalties on the same value of coal under an exchange as if no coal were bypasaed. The variables which would affect royalties paid would be the price of coal and royalty rate in effect at the time it was mined.

If you inteod to mean that the Crow would receive royalty paymenta tranaferred from federal coal leased, mined, aod marketed by another coal company, double royaltiea would not occur in this inatance either. The Crow would merely be receiving royalties io place of substituted toooages, which could alter the timing of revenue flowa but not the total level of royaltiea that the tribe would have received if no Crow coal were aubstituted. Additionally, federal coal leasing regulations do not address the transfer of coal lease tax or royalty revenue from the federal governmeot to an Indian tribe or other persoo or entity. Such transfera would require Coogresaional action.

EEE Two mining options are evaluated in the revised text. (See chapter IV.) The optioos would, to varying degrees, protect North Coulee spring flow.

LETTER 7a

Dobson comments, page 5

Comment	Response
FFF VIII-6. In order to effectuate a continuation of mining and royalty flow to the Crow Tribe, DSL can help to facilitate early access to coal reserves both east of the North Coulee perennial springs and east/southeast of Section 36 into areas indicated for future mining in Figure I-2 containing Crow coal. DSL and OSM must identify considerations which Westmoreland would require, such as expedited moving of the county road, in order to facilitate convenient and continuous mining around the upper reaches of North Coulee, safely above Springs 4, 6, & 11 and into coal reserves east of the perennial springs. The sooner such a move is consummated, the sooner Westmoreland will be free of the constricted cut scheme that is presently so binding.	FFF Before the agencies could evaluate the immediate mining of reserves, both east of North Coulee and east/southeast of section 36, Westmoreland would have to submit a detailed application including environmental haseline studies and mining and reclamation plans. The application would probably require a minimum of severl years of preparation by Westmoreland.
GGG VIII-7. What considerations would Westmoreland seek in order to justify acceptance of such an alternative?	GGG DSL and OSM do not know what considerations Westmoreland would seek.
ADDENDA	
HHH II-3. Can Westmoreland meet all its existing coal delivery obligations by operating only one dragline? Please explain.	HHH Westmoreland's mining plan is designed to produce 10 million tons annually using two draglines. At today's production rate of less than 4 million tons per year, Westmoreland generally operates only one dragline. Both draglines msy be used at times to meet seasonal peaks in coal shipments.
III IV-10. Is the mining area in Sections 31, 3, and 4, identified in Figure I-2, actually a logical mining unit as shown? Please explain.	III Westmoreland has indicated by supplying figure I-2 that the area you refer to would be mined in the future, probably not for 25 years.
JJJ V-10. Hint: Spring 6 is observed about 40 yards below the weir, between the weir and the #80005 permit line, and now to be mined around 1989.	JJJ Comment noted.
KKK V-19. Which spring discharge is identified as Spring 5, the one just above or the one just below the county road in immediately adjacent coulees?	KKK See letter 8, answer H.
LLL VI-14. Westmoreland will not mine most of the south half of permit area 80005 until the new permit is issued. Upon the issuance of the new permit, newly arranged mine cuts might extend from the mine's northern boundary through the south half of permit area 80005. What is not obvious from studying Figures I-1 and I-2 is whether land projected not to be mined until the period 2005-2010 is actually already permitted within 80005. Please discuss whether this area, check-shaded and extending through East Coulee in Figure I-2, the northwest corner of which appears to be permitted under #80005, provides an alternative to mining North Coulee perennial springs.	LLL The area you reference is located south of the fault in permit 80005. Westmoreland has no plans to mine this area under the present permit, although the area is bonded for mining-level disturbance. (See alao answer MMM.) Alternatives to mining the North Coulee drainage are discussed in chapter IV within the constraints of the proposed application boundary.
MMM VI-15. Please explain permit life and whether lands permitted under #80005 but not mined must, at another time, be resubjected to a permitting process.	MMM The area south of the fault in permit 80005 is part of the mining block to be completed in the year 2010 (fig. I-2). It will not be mined under the present 80005 permit. Weatmoreland would have to submit plans for this area in a new application for the mining block scheduled for completion in 2010.
NNN V-20. Comments V-12 and V-15 repudiate the last paragraph of DEIS page III-18. How will the summary of wildlife impacts on page III-18 reflect this?	NNN See answers Y and CC. The summary remaina the same.
OOO V-21. Springs excavated for livestock and then impacted by livestock require occasional re-excavation. Spring 11, presently the least productive and least attractive of the ponded perennial springs, has gone longest without cleaning. To what extent is impaction, rather than drier weather, responsible for the reduced production of Spring 11?	OOO The impact of liveatock use on flow at spring 11 is difficult if not impossible to quantify. Certainly, excavated aprings similar to apring 11 require periodic maintenance if they are to be uaeful aa a water supply. It is unlikely, however, that during the relatively ahort period that flows have been meaaured that liveatock uae of the spring would influence spring discharge. See also anawer O.
PPP V-22. Which of the springs in North Coulee would be lost if improved (excavated) too deeply? How does this reflect upon theories of recharge and perched water table?	
QQQ V-23. Turkeys require water during nesting. How will failure of the windmill/impoundment reclamation plan affect turkey population, dietribution, competition and breeding success?	

Dobson comments, page 6

RRR VI-16. Please note the attached Davenport letter of March 3, 1978, which imposes full responsibility for hydrological analysis upon DSL. There was a concerted effort several years ago, including litigation, to require full consideration of the North Coulee perennial springs hydrology and selective permit denial prior to relocating the county road in a manner so as to predestine future mining plans. A series of maneuvers first restrained and then released the county road relocation prior to North Coulee environmental analysis, after which new regulation assured that road relocation associated with mining would be considered in mine permit application environmental analysis. Now that we have reached the analysis anticipated in the Davenport letter, DSL may be tempted by a particularly fiendish Machiavellian suggestion that the springs must be mined because of the relocation of the county road, DSL's integrity requires that MSUMRA compliance and selective denial implementation not be subordinate to county road placements, present or future.

SSS VIII-8. Given both the failure of the DEIS to examine any alternative in Chapter IV other than rejection of the application and the substantial information provided and requested in comments, I request circulation of a revised DEIS in order to provide an opportunity for public comment on DSL's responses to first round comments. This is particularly necessary since the public was excluded from the DEIS preparation. See Dobson letter to DSL, 5-11-84, which followed several phone conversations during which DSL alleged that the "in house review" was not far enough along for public involvement. Upon receipt of my 5-11-84 letter, DSL stated that the "in house draft" had gone to the printer, effectively shutting the public out prior to circulation of the DEIS.

TTT VII-8. DEIS Appendix C lists the Black-footed ferret as a species relevant to the EIS. Does Appendix C purport to represent all wildlife occuring in the area? In consultation with Ken Greer evidence has been submitted that the mountain lion occurs in the Sarpy Basin. Why is it omitted?

UUU V-17a. Deer may be able to survive without water for extended periods, but what role does the evolution of the local population play? How fast could they adjust?

VVV V-24. Isn't it true that most cattle that die in snowstorms die of dehydration? How does such information affect the value of springs showing free water in winter?

WWW VI-17. In what year is the completion of mining in Tract III projected? Why are the two white areas just inside the eastern mine boundary - between the dotted 2000 area and the Tract III boundary in Figure I-2 - not given completion dates in the legend?

XXX VII-6a. Have spring head and discharge measurements such as (1) cylinder with pumped drawdown and/or (2) horizontal drilling been applied?

Edward M Dobson

Edward M. Dobson 07-31-84

PPP Probably none of the springs in North Coulee would be lost if they were improved by excavation. This is so because variations in the permeabilities of underlying material would preclude significant loss of water to vertical leakage. Aquifer tests and core permeability tests conducted by Westmoreland on overburden, interburden, and coal aquifers, which typically underlie the coulee system, exhibit permeabilities ranging from 1.1×10^{-6} to 6.5×10^{-5} gpd/ft^2. Thus, a hydraulic barrier is most definitely present. Once the pool of water in the excavation reaches equilibrium, it is doubtful that recharge characteristics of the coulee or the hypothetical perched water system in the area would be affected.

QQQ The analysis does not project a failure of postmining water sources. Revised table III-4 highlights unknowns and requirements of the proposal. The reduction of habitat quality and water sources for turkeys is noted on page III-21. Turkey distribution would respond to habitat changes, with loss of woody cover and agricultural land probably having the most effect. During nesting, turkeys on reclaimed lands could use water in proposed developments when available or travel to offsite sources. Nine sources of water for wildlife have been identified within 1.5 miles of the application area (Westmoreland Resources, 1983, ex. G-15). Spicer (1959) observed most nesting hens and poults within 1.5 miles of water. Specific effects on turkey numbers, competition, and breeding success cannot be predicted. Chapter IV now discusses options that would protect wildlife water sources in the application area.

RRR The relocation of the county road has no bearing on the agencies' decision.

SSS The impact analysis evaluates the range of alternative decisions available to DSL and OSM. Chapter III specifically analyzes the applicant's proposal, which would result in the high level of impacts. To the extent that conditions are required by DSL and OSM to bring the proposal into compliance with the state and federal laws, regardless of the specific conditions, the impacts in chapter III would be reduced.

The public was not excluded from the agencies' preparation of the draft EIS. OSM and DSL, in August 1983, mailed several hundred brochures announcing the filing of Westmoreland's application and the intent of the agencies to prepare an environmental impact statement. The brochure also solicited the concerns of the public, following which the agencies received numerous comments. In addition, OSM published a notice of intent to prepare an EIS in the Federal Register. The public had ample opportunity to present their concerns. It is not the policy of the agencies to make working drafts available to the public for review and comment. Public involvement is the function of the draft EIS and the public comment period that follows.

A revised (supplemental) draft is not necessary. Both the National and Montana Environmental Policy Acts provide that agencies will prepare supplements if (a) the agency or applicants make substantial changes in the proposed action; or (b) there are significant new circumstances, discovered prior to final agency decision, including information bearing on the proposed action or its impacts, which change the basis for decision.

The agencies have determined that neither of these conditions have been met, and therefore a supplemental draft EIS will not be prepared.

LETTER 7a

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer To:
EGS-Mail Stop 108

MAR 3 1978

Mr. Peter L. Cook
Acting Director
Office of Federal Activities
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Cook:

In response to your letter of December 19, 1977, expressing several concerns over our approval of the Westmoreland Resources mining plan for Tract III of the Crow Ceded Area, Montana, please be advised that we have given the matter our careful thought.

Concerning your discussion of "unique hydrologic characteristics," we did not intend to imply that EPA had conducted its investigation to evaluate that claim. Our intent was to indicate that our reading of EPA's independent report revealed nothing that would suggest the presence of "unique" conditions, as indeed our own data and studies failed to suggest. Neither did we intend to comment on or appraise local hydrologic conditions in the context of State law and requirements relating to "uniqueness"; that is the function and responsibility of the Montana State Land Department (MSLD). We have no reason to believe that MSLD will fail to fully exercise their responsibility at such time as the area in question comes under the purview of State permitting action in the years ahead; presently no such action is pending before MSLD. We do not believe that a review of this matter as you request is thus warranted.

The Westmoreland plan met the requirements of Federal law and regulation in force at the time of approval. Subsequently, of course, the Surface Mining Act has come into being, and by the terms of the lease, any final revisions to 30 C.F.R. 211, will be applicable to the Westmoreland mine. Also, initial program requirements are applicable pursuant to 25 C.F.R. 177-B.

TTT The appendix's title has been revised. The mountain lion was not covered because 1975-1982 records reveal no observations of this species. These records include systematic and incidental wildlife observations made in Tract III (Dames and Moore, 1975; Westmoreland Resources, 1976-1982) and in the Sarpy Basin (Martin, 1975-1977). (The reports are contained in Westmoreland Resources permit application.)

UUU Although the local deer population is continuously evolving, the development of adaptations to water scarcity is extremely unlikely in the foreseeable future. The time required for major evolutionary change is many thousands to millions of years (Keeton, 1967). Predictions on the evolution of southeast Montana deer would be purely conjectural.

VVV Cattle exposed to snowstorms are likely to die of hypothermia or suffocation before being affected by dehydration (R. Brownson and M. Hall, Montana State University, pers. commun., September 19, 1984). The availability of water does not influence winter grazing on the application area. This area is typically used only from May through October.

WWW Figure I-2 in the draft was in error. Mining would be completed in 2015. The figure has been corrected.

XXX Neither of these techniques have been used in measurement of spring head or discharge by Westmoreland. At the initiation of the spring monitoring program and after a review of appropriate discharge measurement methods, it was decided that discharge measurement methods such as driven sheet piling combined with weirs would be the most appropriate for the conditions in the study area.

LETTER 7a

Of necessity under the new law and regulations the Company is reviewing its present plan for conformity therewith. It seems likely that substantial additional information will be required of Westmoreland and other operating companies, and that many will be required to modify their presently approved plans. At that time all reclamation and hydrologic protection requirements of Federal regulations and Westmoreland's submittals will be carefully reviewed, and your specific concerns carefully considered in light of those regulations.

Sincerely yours,

(Sgd) Joan M. Davenport

Assistant Secretary of the Interior

cc:
Commissioner, Montana State
  Land Department
Director, Geological Survey
Director, Office of Surface Mining
Regional Administrator, EPA,
  Denver, Colorado
President, Westmoreland Resources,
  Billings, Montana

LETTER 8

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STATE LANDS

WESTMORELAND RESOURCES, INC.
POST OFFICE BOX 449, HARDIN, MONTANA 59034 (406) 342-5241

July 23, 1984

Kit Walther
Chief, Environmental Analysis Bureau
Department of State Lands
Helena, MT 59601

RE: Westmoreland Draft Environmental Impact Statement

Dear Kit:

Thank you for sending copies of the Draft Environmental Impact Statement for the Westmoreland Resources, Inc. (WRI) Absaloka Mine Revised Plan. I would like to compliment you and your staff on the preparation of a concise and well written document.

We have reviewed this draft EIS carefully, and submit this letter of comment for your consideration in preparing the Final EIS.

GENERAL COMMENTS

Water Replacement

A The probability that permanent impoundments proposed by Westmoreland will succeed is projected at 70 percent in the Draft EIS (Page III-6). This figure is then repeated in several places (Pages III-19, III-43), and impact projections, particularly as related to wildlife, are based on this assumption. Westmoreland disagrees strongly with this assessment. All available evidence indicates that the probability of perennial water availability exceeds 90 percent.

Westmoreland's analysis (Book I, volume 11), concluded that if overall runoff from the Sarpy Creek drainage is representative of expected runoff from reclaimed land, then the pond will provide water continuously in a year comparable to the lowest observed runoff year during the 10-year period of record (1974 to 1983). Based on this sample, the probability of continuous water availability in any given year is greater than 90 percent.

Stiller and Associates, under contract to DSL, also prepared a probability analysis of pond storage, which Westmoreland has reviewed. This analysis confirms Westmoreland's conclusion, placing the probability of runoff in excess of 4.5 acre-feet at 90 percent. A 4.5 acre-foot runoff is nearly twice the 2.3 acre-foot volume utilized by Westmoreland as a ten-year minimum. According to this analysis, the probability of runoff equal to or exceeding 2.3 acre-feet in any given year exceeds 95 percent.

Another important point to consider is that the Westmoreland and DSL analyses are conservative with respect to runoff predictions, evaporation

A The text has been reworded for clarity. It must be pointed out, however, that these probability statements are only estimates based on limited data and that any interpretations of frequency curves should be used cautiously. Assumptions necessary to use such methodology render the results less precise than might be thought. On the other hand, there are several factors that enter into the pond 20 watershed runoff calculations that we believe result in the unit runoff value being rather conservative. You have referenced the most important of these factors in your comment. We agree with their application to pond 20.

LETTER 8

losses, and pool conditions. These models have assumed that runoff from reclaimed land will be comparable to that observed in large drainages of the Sarpy Creek system. Runoff from small upland watersheds is likely to be proportionately greater than measured far downstream, due to channel storage and evapotranspiration losses along drainageways. The enclosed report summarizes the literature regarding runoff from small watersheds in the Northern Great Plains.

The reclaimed watershed will also be relatively steep. Therefore, assuming similar soils and vegetation, runoff should be somewhat greater than the average for the drainage.

Westmoreland's analysis assumed all runoff to result from snowmelt. It is likely that spring and summer precipitation will result in some runoff during most years. Any such runoff would result in available water in addition to that predicted.

In its calculations of pond water balance Westmoreland used measured pan evaporation rates. However, pan evaporation is recognized to be greater than lake evaporation. Goering and Dollhopf (1982) reported an annual pan coefficient of 0.73 for the Colstrip area. It is likely, therefore, that evaporation losses are slightly overestimated.

An additional consideration is that both Westmoreland and DSL assumed the pond to be empty in late winter at the time of snowmelt. In most years there will be some carryover, particularly since evaporation rates in winter are very low. Extrapolation of the water balance anlaysis shows that with an initial water volume exceeding about 1.93 acre-feet in the pond, water will still be present a year later. According to DSL's analysis, the probability of runoff exceeding 1.93 acre-feet is about 97 percent. Based on the foregoing, the following language is suggested:

> Based on the available data, the probability of continuous water in the pond in any given year exceeds 90 percent.

Erosion and Sedimentation

B The potential for erosion and sedimentation is discussed at two places in the Draft EIS (Pages III-2, III-12). The EIS is inconsistent with respect to the relationship between soil texture and erosion. On page II-1, it is stated that "significant channel erosion has not been observed, due largely to relatively coarse soils, low surface gradients, and good vegetative cover, all of which promote low runoff and high infiltration rates." These "coarse soils" are the same soils suspected of high erosion potential as stated on pages III-10 and III-11. The relationship between infiltration and erosion is inverse, since runoff is necessary for erosion to occur. Therefore, coarse soils do not necessarily promote erosion.

Cohesiveness of the soil also is a factor which must be considered, however. We acknowledge that clean sands are quite erodible. The soils in the application area, however, are fine sandy loams with significant silt and clay content; the finer particles contribute to cohesiveness, thereby reducing erosion potential.

B **The two statements regarding erodibility (pages II-1 and III-10 and 12) are accurate in that the former describes conditions in a low-surface-gradient, well-vegetated channel, while the latter refers to conditions on steep reclaimed slopes. Tbe two cooditions are dissimilar with respect to erosion poteotial of the same fine sandy losm soil types. While this soil type may promote infiltration in a low-gradient channel bottom, the fine and very fine sand content of the soils may increase erosion potential on steep slopes.**

LETTER 8

Runoff from reclaimed lands will occur, but due to at least moderate infiltration potential of replaced topsoils, extreme runoff sufficient to result in significant erosion is unlikely. Vegetative cover will equal or exceed pre-mining conditions, resulting in equivalent erosion protection. It is relevant to point out that these sandy loam soils exist on upper slopes prior to mining and have been cropped and fallowed in the SE¼ Sec 24, T.1N-R.37E, without significant erosion problems. Similar soils have been utilized for reclamation in present mining operations on slopes as steep as 5:1 (20 percent) without erosion problems attributable to soil texture.

For the foregoing reasons, we suggest that the discussions of erosion potential in Chapter III are somewhat overstated.

C Molybdenum in Spoils

Molybdenum levels in spoils are cited in pages iii, II-2, III-1, III-2, III-3, III-4. The suggested mitigating measure (Page III-4) of providing supplemental copper to livestock is a reasonable approach in the sense that use of supplemental mineral blocks is a standard ranching practice in the area. Also, the discussion properly emphasizes that the probability of copper-molybdenum imbalance is low due to mitigating effects of topsoil replacement and low percentage of legumes in the seed mix. There are additional factors, however, which have not been discussed, and which when considered, demonstrate conclusively that observed molybdenum levels in overburden samples constitute a non-problem which hardly deserves mention. These factors include:

1) The classic conditions that result in elevated molybdenum levels include poorly drained soils developed from granitic parent material. Well drained calcareous soils, similar to those found at the Westmoreland operation, do not typically present copper deficiency or molybdenum excess. It is possible that lack of aeration in wet soils results in suppressed copper availability due to a reducing environment.

2) Molybdenosis in livestock is extremely infrequent in Eastern Montana. Presumably, geologic conditions are not conducive to excess molybdenum concentrations. All geologic units to be disturbed by mining are exposed locally and support vegetation utilized by livestock.

3) The suspect level of 1.0 ppm Mo used by DSL may be applicable in wet granitic soils, but is extremely conservative when applied to dry calcareous soils in Eastern Montana. It is stated that "about half" of the samples tested exceeded this level. Of those samples exceeding 1.0 ppm Mo, most are between 1.0 ppm and 2.0 ppm with only a very few samples exceeding 2.0 ppm. Given the overburden mixing which results from the mining process, it is likely that the majority of spoils will exhibit 1.0 ppm Mo or less.

4) Molybdenosis is a chronic rather than acute dietary disorder, and it is virtually certain that even in the worst case, overall dietary intake will exhibit an acceptable copper-molybdenum ratio.

C None of the factors you list demonstrate conclusively that molybdenum would not be a problem. In factor No. 1, you correctly point out that the classic conditions that result in elevated molybdenum levels include poorly-drained soils developed from granitic parent materials. However, although molybdenum absorption by plants increases with increased soil moisture, many other factors also affect the uptake of molybdenum by plants. These factors are discussed in some detail by Vlek (1975, pp. 14-17) and Vlek and Lindsay (1977, pp. 623-624). In addition, the distribution of molybdenum in individual rock types varies. In igneous rocks, it is present at concentrations between 1 and 6 ppm. In shale, it can vary from 1 to 300 ppm. In phosphorites molybdenum varies from 5 to 100 ppm (Chappell, 1975).

In reference to your mention of calcareous soils, note that Kubota (1975) states that legumes grown on calcareous soils had slightly more molybdenum than did those grown on noncalcareous soils. Also, Munshower and Neuman (1978a and 1980) point out that a complicating factor regarding the molybdenum question is the copper content of the vegetation growing on Montana's Northern Great Plains, which generally only marginally meets required cattle nutritional needs. Munshower and Neuman go on to say that the low copper status is common both to native range vegetation and to established plants on revegetated coal mine soils.

In reference to factor No. 2, we agree that molybdenosis in livestock is extremely infrequent in eastern Montana. However, undisturbed geologic units supporting vegetation utilized by livestock do not compare well with disturbed systems. Coal mine spoil is geochemically anomalous when compared to naturally occurring surficial materials. Despite the practice of topsoiling recontoured spoil, there is evidence that the spoil anomalies are being reflected in the element composition of vegetation that grows on the modified material (Erdman and Ebens, 1976). Legumes growing on revegetated mine areas have exhibited a tendency to accumulate even higher concentrations of molybdenum than legumes growing on native range or cultivated fields (Munshower and Neuman, 1978b).

In reference to factor No. 3, we agree that mixing will dilute molybdenum concentrations. But dilution to only 1 ppm, as you suggest, may not be sufficient. The 1.0 ppm suspect level used by DSL for areas containing significant amounts of legumes is extrapolated from the research of Neuman and Munshower (1983), which was conducted at Peabody's Big Sky Mine south of Colstrip. The research showed that some leguminous species appear to have the potential of accumulating problem levels of molybdenum in livestock forage in the vicinity of 1.0 ppm ammonium oxalate-extractable molybdenum in soil or spoil.

LETTER 8

Kit Walther — Page 4

Based on the foregoing as well as the effects of topsoil replacement and low percentage of legumes in the seed mix cited in the EIS, the possibility of copper-molybdenum imbalance in forages grown on reclaimed land is extremely remote.

In regard to factor No. 4, we disagree that it is virtually certain that overall dietary intake will be acceptable. There are many uncertaintiea, discussed in the EIS, that are involved with predicting the potential for occurrence of the disease. We cannot be certain that the chronic nature of the disease will preclude its appearance. Note, however, that molybdenosis ia discussed as s possibility that is unlikely to occur.

D Agricultural Lands

As originally drafted in 1973, Montana law did not provide for reclamation of cropland. Reclamation of rangeland was viewed as a more demanding test of reclamation success, requiring re-establishment of ecologic stability without continuing fertilization, irrigation, or other intensive management practices. Although alternate reclamation of cropland is authorized under the permanent program statute and rules as amended, rangeland is still emphasized administratively as the preferred post-mining land use. We are confident that cropland can be reclaimed with relative ease, but the rules governing cropland reclamation are very complex and demanding. At some point in the Final EIS, the legal and administrative emphasis on rangeland reclamation should be mentioned. Also, it should be noted that future landowners may convert reclaimed rangeland to cropland where slopes are suitable (10 percent or less).

D The law requires reclamation to native rangeland unless the company chooses the option of aubmitting sn alternate reclamation plan to DSL. If the company affirmatively demonstrates that all applicable rules (ARM 26.4.821 through 26.4.825) have been or would be satisfied, the alternate plan would be approved. If the company'a plan did not meet all applicable rules, then the legal emphasis would be on native rangeland reclamation.

SPECIFIC COMMENTS

The following comments are referenced by section and page number; the paragraph number is identified in parentheses where appropriate.

Summary

Revisions to the summary may be necessary for the sake of consistency. In the interest of brevity, the summary is not addressed here in detail.

E Introduction

1N-1(1) Here and elsewhere in the text, it is stated that Westmoreland proposes to mine an additional 629 acres. Westmoreland proposes to permit and bond an additional 629 acres, of which 573 acres will be disturbed by mining activities. Clarification here and in Chapter I is necessary to avoid confusion in interpreting other parts of the EIS. Also, of 2,630 acres currently under permit, 1,769 acres are involved in mining operations. The remaining acreage constitutes facilities and associated disturbance.

E The text has been corrected.

Chapter I - Project Description

F I-1(2) This reference to the "life-of-mine" area is somewhat misleading. This long-term plan was submitted in response to DSL's request to define "all anticipated mining" for the purpose of projecting cumulative hydrologic impacts. For this purpose, only a definition of the area likely to be mined and a generalized sequence of mining are necessary. Detailed long-term mining plans are not available because they are not required by existing rules or for environmental impact analysis.

F Your comment ia noted. We recognize the conceptual nature of the life-of-mine plan. The neceasity of a long-range plan however, is not limited only to the need to asseas the cumulative hydrologic impacts from all anticipated mining. Similar projections must be made for other disciplines in accordance with NEPA and MEPA.

LETTER 8

Kit Walther Page 5

I-1(3) Mine construction began in 1972; production began in 1974.

Chapter II - Description of the Existing Environment

G II-1(4) The dip is 0.3 to 0.5 degrees, not 3 to 5 degrees as stated.

H II-8 Table II-3. The "minor impoundment" below Spring 9 is a hole dug by Westmoreland to obtain water samples. The same is true of the "catchments" associated with Spring 10. Neither of these seepage areas has been developed for livestock watering. Although springs 5 and 261 have frequently been considered to be one and the same, in the interest of consistency the descriptions of these two springs should be interchanged and spring 261 added to Figure II-2, or spring 261 should be deleted from the table.

I II-15(2) The term "wetland vegetation" in the last sentence of this paragraph is incorrect. Presumably, this refers to deciduous shrub vegetation on steeply sloping banks.

J II-18(7) The fourth sentence of this paragraph, regarding silver sagebrush, is unsupported by the data base and should be deleted. Grasslands, including those with silver sagebrush, frequently receive heavier use by mule deer in spring and fall due to normal greening of grasses and forbs.

K II-19(3) According to Dr. Richard Mackie, southeastern Montana offers somewhat marginal habitat for white-tailed deer, with the exception of the major river bottoms. (Literature review of white-tailed deer in southeastern Montana, submitted October 9, 1979). White-tails will extend their range into upland draws and creek bottoms due to population saturation along the Yellowstone River. It is not unexpected that population numbers in these marginal habitats would fluctuate, sometimes dramatically.

L II-24 Table II-9. Samplers 4 and 10 were discontinued in December, 1982. These samplers are not stipulated by Westmoreland's Air Quality Permit No. 1418.

M II-24(5) Dustfall monitoring was discontinued in August, 1982, with approval of the Air Quality Bureau.

N II-29 Table II-12. Total employment should be 286 in 1974 and 185 in 1980 for totals to check.

O II-48(2) The percentage of agriculture in the application area is 23% as compared to 27% in Tract III. The percentage of ponderosa pine in the application area is 36% compared to 22% in Tract III. (Exhibit G-13 and Exhibit G-6, Table 1). The conclusion is incorrect with respect to cropland.

G As stated in Westmoreland's application (bk. D, vol. 3, p. 2.2.2-13), the strata in the project area strike northweat and dip eaatward from 2 to 5 degrees. Please note text change.

H The minor impoundment below spring 9 described in table II-3 is not the hole dug for water quality sampling. Rather, it ia created by an embankment constructed across the coulee about 100 to 200 feet below the actual point of spring discharge. It was apparently constructed well before mining in the area to retain any significant runoff, probably for livestock. It was identified in the field by DSL'a consultant in November, 1979, but has never been reported to contain water.

The same is true of the catchment associated with spring 10. Several such manmade featurea were observed in November, 1979, within 200 feet below the point of actual apring diacharge in the coulee bottom. At least one of these features has been observed to contain water even when no flow was measureable at the spring.

In the absence of any other logical explanation, and because these catchments were observed prior to much of the regulatory interest in North Coulee, and based upon field observations, we conclude that these features exist because the presence of the springs warranted historical efforts to contain surface runoff in the coulee bottoms, even though the springs themselves are well up the coulee.

We agree that the separate designations for springs 5 and 261 are confusing. Westmoreland measures spring 5 discharge as collected seepage in the coulee bottom well below the actual point of discharge near a stock tank. In all likelihood, however, the water Westmoreland is measuring is the same water that is discharging from the spring.

The identification of springs 5 and 261 is further confused by their being mapped made by different organizations several years apart and at different map scales.

In the interest of accuracy and simplification, we accept your recommendation to delete spring 261 from table II-3. Of course, the water still occurs in the coulee bottom, but all water measured and observed in this coulee reach is most probably emanating from spring 5 as identified and described on figure II-2 and table II-3.

I According to the mapping unit description for Aquolls and Aquents, the unit includes "the flat bottom of the drainageway and the short, ateeply aloping banks that are not wet but support hydrophytic vegetation" (Westmoreland Reaourcea, 1983, bk. D, vol. 5, app. 2.) Hydrophytic vegetation grows only in water or very wet earth, that is, in wetlands.

LETTER 8

J The statement regarding silver sagebrush is well supported by data in table II-7. Of 10 habitat types, the silver sagebrush type ranks second in percentage of spring observations (the grassland type was first by only 1 percent) and second in percentage of fall observations (the agricultural type was first). This high ranking, together with the limited availability of the silver sagebrush type (10 percent of Tract III; see table II-6) demonstrates the importance of silver sagebrush between winter and summer.

K The literature review (Mitchell, 1979) refers to personal communications regarding habitat quality (Mackie, 1979) and theorized causes of range extension (Phillips, 1979; Swenson, 1979). In any case, these references do not change the analysis. Martinka (1968) and Bjugstad (1978) have also noted the use of wooded draws by whitetails. The statement regarding the whitetail decline is based on a Westmoreland evaluation (1983, ex. G-13, p. 6).

L The text has been changed.

M The text has been changed.

N The table has been corrected.

O Agricultural land covers 27 percent (155 of 573 acres) (Westmoreland Resources, 1983, ex. G-6, table I) of the application area and about 11 percent of Tract III (Westmoreland Resources, 1983, ex. G-13, p. 2). Ponderosa pine forests cover 42 percent (241 of 573 acres) and 22 percent of Tract III. The conclusion is correct with respect to cropland.

LETTER 8

Kit Walther   Page 6

Chapter III - Environmental Impacts

P III-2(1) Increased sediment loads to East Fork Sarpy Creek are unlikely because runoff from reclaimed lands will be retained in permanent impoundments. It is also very likely that in the case of a runoff event large enough to carry a significant sediment load, the East Fork will be at flood stage and sediment laden as well. Sediment yields from the reclaimed area may actually be reduced from pre-mining levels due to the lack of fallow cropland.

Q III-5(1) We disagree with the prediction that springs 13 and 277 "would probably cease flowing as result of the lowered water table." Neither of the watersheds above these springs will be disturbed by mining under the proposed plan, although a small portion of the spring 277 drainage area is within the application area. The overburden has a low transmissivity, with water level drawdowns extending only a few hundred feet from the mine pit at most. The potentiometric surface in the overburden generally follows the topography, and it is very likely that recharge into the coulee bottom fill from overflow is at least partially responsible for flow of these springs. Therefore, it is very likely that in the worst case, flow would continue at a slightly reduced rate.

R III-5(4) State and federal regulations place limitations on quality of water leaving the permit area, but discharge is not limited. We suggest the word "control" rather than "limit" in the second sentence.

S III-5(7) Westmoreland holds three discharge permits.

T III-6(3) The "70 percent probability" assessment has been addressed under general comments. Also, as stated on page III-37, it is likely that at least one well would be operating in late summer and early fall, providing water for wildlife as well as livestock. In the unlikely event water is not available in the pond in the latter part of a dry year, wildlife would still have water available in the reclaimed area.

U III-7(1) Two impoundments will be constructed on unmined surface, and will contribute seepage downstream. All seepage from Pond 19 will move downstream. The statements in this paragraph are correct with respect to Pond 20 only.

V III-8(1) Spoils are less permeable than topsoils due to a dominant silty clay loam texture. Prior to topsoil replacement, spoils are disced to relieve compaction caused by heavy equipment during the regrading process. Monitoring data collected in 1984 in the drainage bottom reclamation demonstration area have shown saturated conditions through mid-July. It is very unlikely that compaction of spoils in

P We agree that impacts associated with sediment loads from reclaimed areas under the life-of-mine plan on East Fork Sarpy Creek would probably be small if appropriate impoundments are constructed and maintained.

The more important point we attempt to make is that because of the constant drainage network formation process on reclaimed lands, and because of the uncertainty of perpetual maintenance of any proposed permanent impoundments, sediment loads from reclaimed lands to East Fork Sarpy Creek would probably increase slightly. This is not to say that sedimentation is not a naturally occurring process, but rather that, until a quasi-equilibrium is attained in drainage formation processes on the reclaimed lands, the rate of sedimentation may be somewhat higher than before mining.

Q The statement that springs 13 and 277 may cease flowing as a result of a lowered water table due to adjacent mining activity is premised on the location of the springs, their probable source aquifer, and the discharge rates of the springs. If overburden is indeed the source aquifer for the springs, calculations in Westmoreland's application (bk. 1, vol. 11, app. 13) suggest that drawdown in the overburden would extend at least 500 feet from the mining cut. Springs 13 and 277 lie within this potential drawdown area. Discharge from both springs is minimal and apparently stops during the summer, possibly owing to evapotranspiration. Any impact to the springs' source aquifer may eliminate surface flow altogether. We have changed the text, however, to indicate that these springs may recover after reclamation.

R Runoff volumes are controlled under state and federal rules primarily under storm runoff containment provisions. Runoff contained by impoundments is partially lost to seepage and evaporation. In this sense, runoff to East Fork Sarpy Creek is limited.

S We have corrected the text.

T Your comment is noted, and appropriate text changes have been made.

U We agree. See text changes.

V We generally agree. Compaction without discing during the regrading process would help reduce water losses to percolation. Note, however, that in the case of the reclaimed coulee, the 1984 monitoring data are insufficient to demonstrate a trend. The moisture in the spring and early summer of 1984 may simply stem from above-average precipitation, including the May snowstorm and the rains that fell in May and June. The bare-spoil area above the coulee could also contribute a large amount of runoff to the coulee. The pond at the head of the coulee, a temporary structure, could further contribute moisture through infiltration. In any case, Department of State Lands personnel observed in August that all piezometers in the reclaimed coulee were dry.

LETTER 8

Kit Walther — Page 7

		Comment		Response
		drainage bottoms will be necessary or beneficial. Perhaps it would be advisable not to disc these areas prior to topsoil replacement.		
W	III-8(5)	Perhaps it should be mentioned that wells 303, 376, and 377 are abandoned.	W	The status of these wells is depicted in table III-1. Well 377 has been added to the table for the final EIS.
X	III-9	Mitigating Measures. The suggestion that as a mitigating measure, spoils under drainage bottoms and impoundments be compacted to reduce percolation losses, has been addressed above. We suggest revising this statement as follows: To reduce water losses to percolation, Westmoreland could avoid discing (or other measures to relieve compaction) of spoils in coulee bottoms and under impoundments.	X	Your suggestion is adopted, and an appropriate text change has been made.
Y	III-10(2)	Mulch is applied after seeding, not before as stated in the last sentence in this paragraph.	Y	Thank you for correcting us.
Z	III-10(4)	Gully erosion in reclaimed drainage bottoms is inevitable, particularly if runoff occurs prior to vegetation establishment. Gully formation is nothing more than natural channel formation. Experience suggests that once a channel is established and the surrounding watershed is revegetated, further erosion is minimal. In addition, establishment of vegetation in eroded channels provides stability in a relatively short period of time.	Z	We agree with most of your comments. However, note that, on regraded areas, not all gully formation is "natural."
AA	III-10(5)	Use of direct-hauled topsoil in drainage bottoms promotes volunteer establishment of vegetation very quickly. Also, straw mulch inevitably carries some grain seed, which provides short-term erosion protection. Seeding of the drainage bottom mixture at a low rate is not likely to be of any benefit. In addition, this statement is out of place, and if retained, belongs under Mitigating Measures.	AA	We agree with the first two sentences of your comment. In the drainage bottom reclamation demonstration area (incline 2½), rill and sheet erosion and subsequent sedimentation have occurred during the initial reclamation phase. We believe that immediate seeding of the drainage bottom mixture at a low rate would help prevent some unnecessary soil loss while preventing excessive competition with the shrub seedlings. The statement has been retained in the text, but has been added to the Mitigating Measures section.
BB	III-10(7) II-12(1)	In the recontouring plan, slopes steeper than 5:1 (20 percent) are planned for ponderosa pine plantings. It will be necessary to use well drained scoria or sandstone derived soils on these slopes to promote ponderosa pine regeneration. Therefore, options for selective placement of finer textured soils do not exist unless the revegetation plan is modified. In the case of steep drainage side slopes, erosion has not been experienced in the reclaimed drainage bottom demonstration area. Run-in from adjacent upper slopes is intercepted by scoria-covered terraces and infiltrated.	BB	We agree. Please note text changes.
CC	III-12	Mitigating Measures. Westmoreland and DSL have addressed the option of decreasing the volume of sandy soils proposed for salvage, and the guidelines outlined here will be adopted in a revised soil handling plan currently in preparation.	CC	The Department of State Lands does not have a revised soil handling plan on file for the proposed permit area. Therefore, the recommended revised salvage depths for specific soils remain as mitigating measures. Regarding your comment on selective handling, please refer to answer BB.

LETTER 8

Kit Walther — Page 8

For reasons stated above, selective handling is neither feasible nor necessary in these instances. This mitigating measure should be deleted.

Response DD: Rule 26.4.721 (ARM) requires the company to repair rills or gullies deeper than 9 inches. Careful monitoring of the development of rills or gullies would allow the company to take immediate action to prevent unnecessary soil loss, instead of waiting until the problem is more advanced. The mitigating measure has been retained.

DD Under Rule 26.4.721, remedial action must be taken in the event of excessive rill or gully erosion; a specific mitigating measure is unnecessary. As stated above, however, gully formation in channel bottoms is to be expected as a natural channel forming process.

Response EE: Comment noted. Thank you.

EE Since mining activities will proceed down gradient, measures to drain saturated soils may not be necessary.

Response FF: Your comment conflicts with baseline information provided in your application (1983, ex. H-7 and H-12). Premining acreages were derived from acreages of subtypes given in exhibit H-7. These subtypes were grouped into types based on exhibit H-12, pages 10-19. In addition, some figures listed in the comment contradict baseline information.

FF III-13 Table III - 3 Based on the sources listed for this table some numbers for pre-mining acreages are in error. Below is a list of vegetation subtypes that should be included in the acreage computations for each premining community type (from table 1, page 2, exhibit H-7) and their acreage totals:

Grassland		Ponderosa Pine		Drainage		Agriculture	
Si	35.9	Si-PP	10.5	M	0	Ag-1	0
Si-1	38.9	Sy-PP	30.2	WL	3.8	Ag-2	88.4
Si-2	3.0	SW-PP	1.3	Sb	0	Ag-3	66.5
Si-1-2	.4	Tb-PP	4.2	OV	0	Ag-4	0
Si-3	49.7	UR-1-PP	10.5	UR-1	9.5		154.9
Sy	.3	PP-1	61.8	UR-2	3.2		
Sy-1	0	PP-2	122.3	UR-1-2	0		
Sy-2	0		240.8	UR-3	.2		
Sw	.3			UR-4	.4		
Tb	.8			P	.6		
DG	26.5				17.7		
R	2.1						
GP	2.0						
	159.9						

These changes will effect the community type percentages discussed elsewhere in the EIS.

Response GG: The long-term reestablishment of a closed-canopy forest is uncertain. The paragraph adequately describes the processes and problems involved in reestablishing a closed-canopy forest.

GG III-14 Ponderosa Pine. The statement "this subtype (closed canopy pine) would probably be eliminated" should be qualified by adding "in the short-term." It is probable that the closed canopy type will re-occur in the long-term through volunteer growth and seeds from planted pines as the remainder of the paragraph discribes.

Response HH: We have reviewed the paper. Survival rates for ponderosa pine were the same as rates given in the personal communication. Relevant citations have been changed from personal communications to Amendola et al. (1984).

HH In the interest of using current information, the following paper (copy enclosed) should be consulted for the most recent data on ponderosa pine survival rates:

Amendola, F.A., M.D. Mitchell and D.W. Simpson. 1984. Reclamation of tree and shrub species at the Absaloka Mine. In Symposium on Surface Coal Mining and Reclamation in the Great Plains. Billings, Montana. March 19-21.

LETTER 8

II III-14-15 Drainage Bottom Shrubs. The above paper also includes short-term shrub survival data for the reclaimed drainage bottom demonstration area constructed and planted in 1983. A dry year could be a major obstacle to revegetation success when planting seedlings; however, deciduous shrub and tree seedlings planted survived an extremely hot and dry summer and exhibited high survival percentages, indicating that measures to concentrate surface moisture are effective.

JJ III-15 Aquatic Vegetation. We presume that the estimate of 7.5 acres of aquatic vegetation to be reclaimed was calculated from Exhibit H-9, Plate 1, which reflects maximum pool elevations of permanent impoundments. Westmoreland did not state a figure for acreage of reclaimed aquatic vegetation in its application and references to "proposed acreages" should be deleted.

Based on experience in the mine area, any ponding of water will promote growth of aquatic vegetation. We anticipate that emergent aquatic vegetation will be damaged by livestock, grazing and trampling, as has been the case in the application area prior to mining.

KK III-15-17 Mitigating Measures. Because warm-season grasses are not a factor in grazing management in the Sarpy Creek area, extreme measures are not justified. The upland mix includes 60 percent warm-season grasses due to the relative difficulty in establishing these species. Identification of "favorable microsites" is difficult because such microsites are ill defined. Assuming such microsites exist, the dominance of warm season species in the seed mix should assure establishment.

LL Since closed canopy pine stands are likely to develop in the long term as discussed above, the need for increased planting is questionable.

MM Since 1978, Westmoreland has pursued a very aggresive tree and shrub establishment program. Virtually all of the suggested means of enhancing establishment have been considered, and several, including use of containerized seedlings, herbicides, deer repellents, and drip irrigation have been utilized at various times or implemented as standard practices. Other approaches, including shading, water harvesting and snow management are currently being tested, using both bare-root and containerized stock.

NN Recent success of plantings utilizing topographic design and appropriate soils to concentrate and conserve moisture has eliminated the need for irrigation or intensive management to reduce competition. Again, we suggest a review of the recent publication by Amendola et al. (1984) referenced above.

II The survivsl rates for chokecherry, plum, and currant (Amendola et al. 1984) have been added to the text. The inadequate sample size for hawthorn precludes its use in the text. Westmoreland (1983, ex. H-9, p. 2) hss not committed to planting other tested species. Precipitation data provided by Amendola et sl. (1984, p. 2) do not support the statement regarding the extremely dry summer. (No temperature data are given.) If the summer is defined as June-September (Hardin's growing season; Toy and Munson, 1978), the 1978-83 medisn summer precipitstion is 4.51 inches, while the mean is 4.56 incbes. The 1983 summer precipitation of 4.97 inches is above both of these figures. The text notes the moisture-conserving festures of the reconstructed drainages (pp. III-8 snd III-15).

JJ Your presumption is correct. The acreage of aquatic vegetation was estimated from exhibit H-9, plate 1, which is part of Westmorelsnd's application. As discussed in the text, even maximum pond sizes would he insufficient to support the amount of aquatic vegetation shown in exhibit H-9, plste 1. The comment referring to ponding of water is noted. Your final comment agrees with the text.

KK All four warm-season grasses in the uplands mix (app. E) provide good cattle forage and are classified as decreasers (Yaeger et sl., 1976; Long, 1981; U.S. Soil Conservation Service, 1981). The four species are important components of climax vegetation that may grow in the application area's range sites (U.S. Soil Conservation, 1981). Increasing their proportion on the range would increase range condition and recommended stocking rates. Tberefore, warm-season grasses must be considered a factor in range management. We believe the mitigating measure is feasihle.

Warm-season grasses proposed for seeding are adapted to coarse-textured soils (Yaeger et al., 1976; Long, 1981). Field identification of these soils, altbough occssionally difficult, is certainly feasihle. Seeding favorable sites with warm-season grasses would tend to increase their ground cover within those sites.

LL The uncertsinty of reestahlishing a closed-canopy forest (see answer GG) and the time required for planted pines to furnish seeds (see p. III-14) make increased planting desirsble.

MM We recognize Westmoreland's tree and shrub establishment research. However, the EIS is hased on Westmoreland's revegetation plan (ex. H-9) which commits Westmoreland to none of the measures mentioned in your comment.

NN The high survival rates for s single growing season reported hy Amendola et al. (1984) are encouraging. However, they do not demonstrste thst the need for reducing competition from herbaceous species or irrigation has been eliminated. In other studies, competition has limited shruh estahlishment and controlling competition improved shrub survival (Brown and Martinsen, 1959; Fedkenheuer et al., 1980; Ferguson and Frischknecht, 1981; Institute for Land Rehabilitation, 1979; Penrose and Hansen, 1981; Van Epps and McKell, 1983). Irrigating to improve tree and sbrub survival has frequently been advised (Bjugstsd, 1984a; Bjugstad, 1984h; Ferguson and Frischknecht, 1981, Institute for Land Rehabilitation, 1979; Orr, 1977; Penrose and Hansen, 1981; Ticknor and Hintz, 1984; Williamson and Wangerud, 1980).

LETTER 8

Kit Walther — Page 10

	Page	Comment		Response
OO		In establishing vegetation in and adjacent to permanent impoundments, Westmoreland will conduct planting or seeding necessary to introduce adapted species. Westmoreland has committed to introducing aquatic or drainage bottom vegetation into areas where such vegetation does not naturally invade. This may include transplants and introduction of native seed of species such as cattails, bulrush and selected sedges as described in Exhibit H-9. Garrison creeping foxtail is not a species common to this area and is therefore not proposed for use.	OO	A commitment to planting shrubs or grassland seed mixtures around reconstructed ponds is not in Westmoreland's revegetation plan (1983, ex. H-9). The mitigating measure was added in response to noncommittal language regarding introduction of cattails, bulrushes, and sedges. The portion of the mitigation regarding Garrison creeping foxtail has been deleted.
PP	III-18	Aquatic Ecology - Mitigating Measures. With two permanent impoundments, there is no need to increase aquatic habitat after mining. Additionally, overflow ponds are not likely to be feasible due to intermittent pumping. Aquatic habitat is an incidental result of livestock water development, and it is very doubtful that overflow ponds would be maintained after bond release.	PP	Although the impoundments would be permanent, they may not contain water in all years, or may not be maintained after bond release. The overflow ponds are simply one method to re-create aquatic habitat.
QQ	III-18	Because of the mobility of most wildlife species, it is doubtful that the pre-mining density of water sources in the Application area is necessary, and therefore, the removal of these areas will probably be of negligible impact to wildlife. In addition to the permanent water sources proposed for reclaimed areas, wildlife will have easy access to perennial water sources located in Sarpy Creek and East Fork of Sarpy Creek as well as in adjacent tributary drainages. There are also a number of intermittent water sources in these areas.	QQ	A large number of relatively nonmobile species inhabit Tract III (Westmoreland Resources, 1983 ex. G-13). These species are primarily reptiles, amphibians, or small mammsls, although some medium-sized mammals also have small home ranges. It would be difficult or impossible for the less mobile species to resch offsite water. Revised table III-4 indicates availability of water on the application area after mining. We agree that highly mobile species, such as deer, could use offsite water. As discussed in the text, however, the postmining habitat quality of the application ares would be lowered.
RR	III-19(3)	The temporary decrease in thermal, escape and reproductive cover would have a negligible impact on mule deer. Undisturbed ponderosa pine stands are available within and around the mining area well within the home ranges of mule deer. The benefits of open areas created by mining and reclamation adjacent to the pine stands is likely to balance the negative impacts of the reduction of pine forests in the application area.	RR	The analysis projects a decline in the quality of deer habitat and a small effect on the deer population. A small effect is not necessarily synonymous with a negligible effect. Messuring change in population caused by habitat change would be extremely difficult. The 62 percent open foraging areas and 37 percent cover before mining (table II-5) resembles the 60 percent to 40 percent ratio characterizing optimum deer ranges (Thomas et al., 1979). The proposed change to 74 percent open foraging areas and 26 percent cover (table III-3) represents a decline in overall habitat quality.
SS	III-2(2)	**Although sharptails have been observed occasionally in ponderosa pine habitats, these birds are more commonly associated with open grassland or shrub grassland areas. Reclaimed areas should benefit sharp-tails by increasing the amount of open grassland in the Tract III area.**	SS	The benefits of reclaimed grassland to sharptails are discussed on page III-21. However, the prominence of deciduous trees and shrubs to sharptail habitat (Aldous, 1943; Rogers, 1943, in Evans, 1968; Pepper, 1972), suggests that a decrease in deciduous cover would reduce habitat quality. Also, Evans and Deitz (1974) state that buds and berries form a major portion of the sharptail's winter diet.
TT	III-21	**Waterfowl. The springs and ponds within the application area are not used consistently by waterfowl as nesting and brood rearing areas. The proposed permanent water sources for reclaimed areas will serve the same function for waterfowl in the postmining condition as the water sources in the application area now serve, primarily as occasional resting areas.**	TT	The EIS discusses a potential for waterfowl production. This potential is based on documented waterfowl production from Tract III (Westmoreland Resources, 1983, ex. G-4, 5, 6). The EIS also notes the value of reconstructed ponds as resting areas.

LETTER 8

		Comment	Response
UU		Raptors. Raptors, specifically red-tailed hawks, may not be as sensitive to disturbance as the literature may indicate. An active nest which fledged three young was discovered in the Critical Fragile Area at Absaloka Mine in the spring of 1984. The Critical Fragile Area is bordered on two sides by active haul roads. Frequent observations indicated that great horned owls may have nested in the same area in 1983. In addition, northern harriers have been documented as nesting on reclaimed land in 1982. In 1983 and 1984 observations suggested nesting activity on reclaimed land although no nests were found.	Tolerance for disturbance varies among individual raptors. However, the literature supports the concern expressed in the text.
VV		Songbirds. Solitary vireos, yellow warblers, rufous-sided towhees and other songbirds, are associated with shrub thicket habitats, not perennial water and associated aquatic vegetation as implied here. Shrub habitats will be re-established, and habitat needs of these species will be restored.	The species discussed are often associated with water/deciduous vegetation ecotones (Robbins et al., 1966; Thomas et al., 1979). The presence of open water apparently increases avian diversity in coulees. This can be demonstrated by comparing songbird data from the North Coulee (open water present) to data from Peter's West Coulee (no open water) (Westmoreland Resources, 1983, ex. G-13, section II).
WW	III-22,23	Mitigating Measures. Re-establishment of habitats for snakes and rabbits is not a reclamation objective. Vegetation sampling crews have not reported a rattlesnake shortage on reclamation, presumably due to the abundance of small mammals. Additionally, rabbits can be very destructive to tree and shrub plantings.	Westmoreland (1983, ex. E-4) states that "wildlife habitat is an important consideration" in postmining land use. Both snakes and rabbits qualify as wildlife requiring habitat. Although reclaimed land would be suitable for rattlesnakes, it could be improved by adding additional cover. Rocky areas are a consistent feature of rattlesnake habitat (Barker, 1964; Leviton, 1973; Stebbins, 1966). Brush piles could be placed near the center of reclaimed grasslands, away from shrub and tree plantings. Rock and brush piles also supply habitat for reptiles, small mammals, and birds (Hayden-Wing, 1984).
XX		Techniques for creating new dancing grounds for sharp-tailed grouse described by Ecological Consulting Service were used in 1980 with no success. In 1983, sharp-tails established a dancing ground on reclaimed land on their own which was attended by 14 displaying males. In 1984, a maximum of 30 males was observed displaying on the same ground.	We recognize that aharptails may establish new dancing grounds on their own. Ecological Consulting Service (1967, 1977), however, suggests that techniques used to attract sharptails may be important in establishing new grounds. These techniques included mowing vegetation, setting out decoys, and playing recordings of grouse. Sitea could also be improved by controlled grazing and selective soil replacement.
YY		As noted earlier, overflow ponds in conjunction with wells are not necessary and are not likely to be practical in the long term. Similarly, it is doubtful that improvements designed to facilitate wildlife use would be maintained in the long term.	Although many wildlife species will drink from stock tanks, ponds and seeps provide better habitat. The suggested improvements, especially the overflow ponds, would create more attractive wildlife habitats. The long-term maintenance of the improvements, and of the wells themselvea, is uncertain (table III-4).
ZZ	III-36(2)	The change in royalty rate to 12.5 percent as stated here is not a foregone conclusion, and should be stated as an assumption based on royalty rates for new federal leases. Westmoreland's lease specifies that the renegotiated royalty rate reflect royalties "being paid and received for coal of like grade, quality and approximate quantity mined in Montana, North Dakota and Wyoming." Although new federal leases carry a 12.5 percent royalty, very few such leases, are currently producing and paying royalties. It is difficult to predict the situation which will exist in 1994.	Your comment is noted. Please aee text change.
AAA	III-39	Table III-10. Ponderosa pine is indicated as a land use, but is not discussed in the text. The primary use of pine stands is grazing, since lumber is of very poor quality. Also, closed canopy stands are often stagnated "doghair" thickets	Your comment is noted. The range noted in table III-10 includes open canopy ponderosa pine. The composition of rangeland has been clarified in chapter II. The closed-canopy ponderosa pine, although not an agricultural land use type, is included in the table for purpoaes of illustrating change.

LETTER 8

Kit Walther Page 12

of small trees. Harvestable timber, such as it is, is more often associated with more open stands.

BBB III-42-44 Discussions of Irreversible and Irretrievable Commitment of Resources and Short-term Uses versus Long-Term Productivity are largely repetitive. Comments on Chapter III are applicable here as well where appropriate.

Please call if you require any clarification or further information regarding these comments. We will look forward to the publication of the Final EIS in the near future. Thank you for your consideration of our comments.

Sincerely,

David W. Simpson

David W. Simpson
General Manager - Operations

dlm
Enclosures
CC: George Miller
C. J. Presley

BBB Your comment is noted. Appropriate text changes have been made.

LETTER 9

STATE OF MONTANA
ENVIRONMENTAL QUALITY COUNCIL
STATE CAPITOL
HELENA, MONTANA 59620
(406) 444-3742

Deborah B. Schmidt, Executive Director

August 2, 1984

Dennis Hemmer, Commissioner
Department of State Lands
Capitol Station
Helena, MT 59620

Dear Dennis,

I have reviewed the draft environmental impact statement on Westmoreland Resources' revised plan for the Absaloka Mine, Big Horn County, and offer the following comments on behalf of the Environmental Quality Council. EQC's role in commenting on the DEIS stems from our statutory obligation to oversee agency implementation of the Montana Environmental Policy Act. For this reason, our comments focus primarily on compliance with the MEPA-imposed obligations of full disclosure and thorough consideration of environmental impacts and alternatives.

A primary concern of the Environmental Quality Council is the effectiveness of the environmental impact statement as a public information document. The EIS must clearly indicate how the proposed action will affect the environment so citizens can participate intelligently in the public policy decision.

In large part, the EIS on Westmoreland's revised mining plan adequately serves this public information role. The EIS indicates the tradeoffs between coal development and existing environmental values, citing the economic benefits of approving the mine permit application and the environmental costs, which include the loss of up to 11 natural springs, the reduction in forest cover and vegetative diversity, and the degradation of wildlife habitat. The EIS also reviews the likely post-reclamation conditions of the physical and biological environment.

A The manner in which mitigating measures are presented in the DEIS, however, limits the value of the document as a public information source. The DEIS states (page IN-6), "Not until issuance of the approvals to mine would it be known which, if any, mitigating measures would be attached to the permit as special conditions." The phrase "would it be known" implies that mitigating measures will be imposed by a third party and are not under the control of the Department of State Lands. This language needs to be changed to clarify that DSL is responsible for imposing necessary mitigating measures.

A The sentence you refer to means that the special conditions are not decided upon until the final atage of the agenciea' decision process. It is incorrect to infer that the mitigating measures would be imposed by a third party or are not under the control of DSL. See also answer D and letter 7, anawer SSS.

LETTER 9

Mr. Dennis Hemmer
Absaloka/2

B A more fundamental concern is DSL's failure to specify which mitigating measures it would apply to the mine permit, should approval be granted. The failure to specify mitigating measures presents difficulties for both the public and the mine permit applicant. To comment intelligently on the advisability of granting the permit, the public needs to know what environmental impacts are likely to occur. These impacts are largely determined by the specific mitigating measures attached to the permit.

For example, the DEIS notes two cases where the reclamation plan calls for selective salvage and replacement of specific soils, and the DEIS cites four other soil conservation measures which the company "could" utilize. If these four mitigation measures are not made conditions of the permit, significant erosion could presumably occur. Some citizens might oppose the project on this ground. If the measures are mandatory, these same citizens might view the permit application favorably. In the absence of a clear statement on the required mitigating measures, however, the public has no way of knowing what impacts the project will cause and thus may be unable assess the merits of the application.

Similarly, the permit applicant needs to know what mitigating measures DSL is considering imposing. These measures will affect planning, engineering and economic aspects of the mine development; as a result, the company should have the opportunity to comment on the state's recommended mitigation measures through the EIS process.

C Under the approach used in the DEIS (i.e., mentioning mitigation measures, but not specifying which ones will be applied), there are a number of public information obligations which DSL has not met. First, the department should have explained the criteria it will use for attaching mitigating measures to the mine permit, should it be approved. Will public comment, compliance with the goals of the reclamation plan, cost-effectiveness, or other criteria be considered by the department? The criteria must be specified so the public will know on what the department will ultimately be basing its decisions on the application of mitigating measures.

D Second, the department should clarify whether or not it has the authority to impose each mitigating measure mentioned in the DEIS. If the department does have the authority to impose every mitigating measure noted in the text, this should be so stated. If the department does not have the authority to impose some of the specific mitigating measures mentioned in the text, the public also needs to know this. There is a significant difference in the likelihood of mitigation between (a) measures which the company "could" impose and (b) measures which the department has the authority to mandate.

E Third, the DEIS should clarify whether all the mitigating measures cited as being part of the reclamation plan will automatically be conditions of the permit, should the mine permit be issued.

F A table summarizing the adverse environmental impacts for each topic (soils, hydrology, wildlife, etc.) and the potential mitigation measures

B We believe reviewers are able to make informed and useful comments on the agencies' analysis of the proposed action without having to know which mitigating measures suggested in the EIS would be imposed as special conditions. Moreover, readers are able to express their concerns and preferences before the agencies determine which mitigating measures would be imposed as special conditions. Such comments from the company and the public are given equal consideration in the agencies' decision. See also answer D and letter 7, answer SSS.

C The criteria you suggest are all used by the agencies when selecting mitigation measures that would be imposed aa special conditions.

D Mitigating meaaures analyzed in thia document are in the areas of geology, hydrology, soils, vegetation, wildlife, and aquatic ecology. DSL has authority to mitigate impacta in all these areas.

E All measurea in the company's proposed reclamation plan that do not conflict with applicable lawa would be required if the application is approved.

F See chapter IV, table IV-5.

LETTER 9

Mr. Dennis Hemmer
Absaloka/3

mentioned in the text would be particularly helpful to those reviewing this and future impact statements. An abbreviated example of such a table might be as follows:

Topic	Environmtl. Impacts	Mitigating Measures	Impos. of Mit. Meas.	Authority to Impose Mit.Meas.
Soils	Compaction in coulees	Dry soils prior to placement	No decision proposed	SUMRA (MCA citation)
	Gravelly, unsuitable for grass	Gravelly soils to be placed in pine sites	Included in reclamation plan	SUMRA (MCA citation)

G A second shortcoming of the DEIS is lack of consideration of the grounds under which the selective denial criteria might be applicable. As noted in the DEIS introduction, MCA 82-4-227(2) provides that the department shall not approve a strip-mining permit on land which has "special, exceptional, critical or unique characteristics," or where mining would "adversely affect the use, enjoyment or fundamental character of neighboring land having special, exceptional or unique characteristics." One criterion used to define these characteristics is "ecological fragility, in the sense that the land, once adversely affected, could not return to its former ecological role in the reasonable foreseeable future."

The North Coulee area, with its complex of groundwater springs and its high wildlife habitat values, may fall into the category of ecologically fragile and having special, exceptional, critical or unique characteristics. The East Fork of Sarpy Creek may also fit these criteria as applied to "neighboring land." The DEIS should contain a thorough discussion of whether the selective denial criteria apply, what the mine plan alternatives would be if the mining permit were selectively denied in all or part of the North Coulee area, and what the economic and environmental impacts would be from this alternative. The department should also discuss the basis upon which it reached its decision on selective denial.

I hope to be able to discuss these concerns with you and your staff in the near future. Thank you for the opportunity to comment.

Sincerely,

Hugh

Hugh Zackheim
Associate Resource Scientist

Z:absaloka eis

G Your comment is noted. Chapter IV now contains an analysis of two selective rejection options.

LETTER 10

PATTEN & RENZ
ATTORNEYS AT LAW
LOWER LEVEL ONE
FIRST CITIZENS BANK BUILDING
2812 1ST AVENUE NORTH
BILLINGS, MONTANA 59101
(406) 252-6782

JAMES A PATTEN
JEFFREY T. RENZ
PATRICK L SMITH

OF COUNSEL
FRED N OUGAN

RECEIVED
STATE LANDS

August 3, 1984

Mr. Dennis Hemmer, Commissioner
Department of State Lands
Capitol Station
Helena, Montana 59620

Re: Absaloka Mine Draft EIS

Dear Mr. Hemmer:

Thank you for the opportunity to comment. For convenience, I have keyed my comments to the pages of the DEIS.

INTRODUCTION

A IN-1. The summary of MEPA requirements (set out at pp. IN 1 to 2) is incorrect. For a complete summary of the requirements of State Environmental Policy Acts, you should review "The Coming of Age of State Environmental Policy Acts, 5 Public Land Law Review 31-54 (Spring 1984) (hereinafter "SEPA".)

B IN-3. Paragraph 3 indicates that a 13 year mine plan is analyzed in the DEIS. As you know, the Department may permit for only one five year plan at a time. §82-4-221, M.C.A. (1983). Why is this draft prepared on a 13 year rather than a five year plan?

C IN-5 to 6. The alternatives set out on these pages appear to reflect only those actions within the authority of the Department. The DEIS has failed to consider alternatives outside the Department's immediate authority and alternatives which achieve the objective of Westmoreland Resources Inc.'s proposal (coal production). See SEPA at 46.

CHAPTER I.

D The dates in Figures I-1 and I-2 are inconsistent with each other and with the discussion at IN-3. Portions of the Permit area and 13 year plan will not be mined until 2010 (Figure I-2).

A The discussion on IN-1 and IN-2 summarizes the general procedures the agencies follow. It does not attempt to completely list the requirements of MEPA.

B DSL's permits authorize mining for a period of five years from the date of issuance, whereupon the operators must seek renewals. Mining and reclamation plans submitted in a company's application may include all lands reasonably anticipated to be mined, and is not required to be limited to only five years of mining. Westmoreland's application includes both detailed operating and reclamation plans, and baseline data, for 13 years of mining. The agencies decided during the scoping process that Westmoreland's 13-year plan would constitute the scope of analysis of the EIS. The scope of analysis was described in the information brochure that was distributed to solicit public comment. This approach allows for the most comprehensive analysis possible and the most efficient compliance process.

C All reasonable alternatives have been analyzed. Your comment does not suggest any specific alternative that has not been considered by DSL and OSM. Two options have been added to the final EIS in chapter IV which illustrate two levels of selective rejection. The EIS analyzes the reasonable options for mining around North Coulee.

D The portion of the application area that is scheduled for mining completion in 2010 (figure I-2) would be bonded only for associated disturbance under the 13-year plan.

Mr. Dennis Hemmer, Commissioner
August 3, 1984
Page 2

CHAPTER II

E II-1 to -3. The geology section omits any discussion of the permeability, conductivity, and transmissivity values of the overburden and interburden. Such discussion is omitted for the area immediately surrounding and downhill from the application area. Have these values been determined? If so, why are they not included in the DEIS?

F II-6, ¶2. I am surprised that the Department continues to rely on Mr. Botz's study. In 1980, while he was testifying on the previous permit application, Mr. Botz admitted that there were 10 springs per square mile in the North Coulee Area. Mr. Botz also testified that the greatest concentration of springs in his report was 6.8 springs per square mile. His report covered 176 townships. While the statement contained in this paragraph is technically correct, it is, sadly, misleading.

G II-9 to -11. The groundwater discussion fails to include the reports and testimony submitted by Dr. Steve Custer in 1980. Divergent views must be included in an EIS.

H II-11, ¶1. Compare this statement with the conclusion at p. III-8, ¶2.

I II-15 to 17. The vegetation discussion omits any measure of carrying capacity.

J III-2, ¶1. This paragraph notes that erosion and sedimentation will occur until hydrologic stability is reestablished. When will hydrologic stability be established?

K III-2, ¶3. This paragraph notes that the life of mine plan will remove only 30% of the economically recoverable coal in Tract III. Please discuss the coal conservation requirements here.

L III-4, ¶2. I note first that this mitigation discussion has no bearing on correcting the source of potential molybdenum poisoning, but instead looks to correct the secondary impacts of molybdenum in the soil. What mitigation measures are available to prevent suspect concentrations from occurring after reclamation?

M Secondly, it would also appear that alfalfa may not be produced on these reclaimed lands.

N Thirdly, what is the cost of special ordering salt blocks with copper supplements. Is there any evidence that this will prevent molybdenosis? It would appear that cattle obtain their minerals from forage in the first instance and supplement their needs at the salt block. Using a salt block with a copper supplement will not prevent ingestion of harmful concentrations of molybdenum.

O III-6, ¶2, 3, 4. The potential for sedimentation in the post-mining reservoirs seems to have been glossed over. At page III-5, the DEIS notes that peak surface flows will increase and base surface flows of water will decrease as a result of mining. Should this not increase the sediment load.

P At page III-6, ¶6, the DEIS notes that even East Fork Sarpy Creek will realize

E These values have been determined and are available in Westmoreland's permit application (bk. I, vol. 11, ex. I-33). These types of data are not generally repeated in the EIS for the sake of brevity.

F There appears to be some confusion concerning the importance of Mr. Botz's December, 1981, testimony. Examination of the document referred to during Mr. Botz's testimony (Westech, 1977, table 2), suggests that the column within which the number 6.8 appears is the mean, or average, number of springs per section in the township. This further suggests that the actual number of springs per square mile ranges from less than to greater than 6.8 within that section. It is questionable whether the 10 springs allegedly present within one square mile around North Coulee is statistically greater than the greatest number of springs per section in the township referenced in the document.

See also letter 7, answer BBB.

G The description of the ground water resources on the pages you reference does not differ substantially from any testimony presented by Dr. Custer in 1980. Indeed, Dr. Custer's interpretation of the ground water system in North Coulee is consistent with our interpretation presented in DSL's 1979 final EIS and in this EIS.

H We assume you are referring to the suitability of ground water in the postmining spoil aquifer as a potable water supply when compared to premining ground water quality. The projected total dissolved solids concentration range of 2,600 to 2,900 mg/l for spoil water quality is within the range of ground water quality values for southeastern Montana. The spoil ground water is certainly usable as a stock supply and, although probably not desirable, may be considered a domestic water supply.

I For livestock, carrying capacity is usually expressed as recommended stocking rates (U.S. Soil Conservation Service 1971). These rates are discussed under Land Use. The relationship between vegetation and wildlife species is discussed in the wildlife section.

J The time required for the reestablishment of hydrologic stability on reclaimed land is extremely difficult to accurately project. The rate at which hydrologic stability would occur is based on many factors, including the success of revegetation and landscape design, as well as the severity and extent of differential spoil settling. Once vegetation is reestablished, erosion and sedimentation rates would approach premining levels.

K The coal conservation requirements are applicable to the life-of-mine plan when Westmoreland submits future applications to mine. Westmoreland has demonstrated under the 13-year application that it will comply with the coal conservation provisions. Note that the life-of-mine plan retains sufficient opportunities for Westmoreland to recover in the future more than 30 percent of the economically recoverable coal in Tract III. (See also text change.)

LETTER 10

L As is discussed in the EIS, the molybdenum levels only slightly exceed the suspect level (which is simply a guide and not an absolute number), an abundance of chemically suitable soil is available, and few leguminous plants (molybdenum accumulators) are proposed in the revegetation seed mixtures. Although blooms of sweetclover could occur in the reclamation area, the animals would have to graze primarily on this vegetation for problems to occur. (Of course, this assumes that all of the sweetclover would have unfavorable molybdenum levels, which is unlikely.) In addition, the amount of sweetclover generally decreases as native vegetation becomes established.

The analysis considers molybdenosis because of its possible occurrence; however, the likelihood of its occurrence is small. The mitigating measure regarding mineral blocks is merely a precaution. Please see answer N.

If molybdenosis in grazing animals were likely to occur as a result of the company's reclamation plan and overall overburden quality, one of two things would most likely be required. First, the company could be required to further delineate the extent of overburden with elevated molybdenum levels prior to mining, and selectively handle this material so it is replaced outside of the rootzone. Secondly, the company could be required to add molybdenum to the list of parameters examined during the regraded spoil sampling program.

M Alfalfa is not proposed as a species in the revegetation seed mixtures. Alfalfa has been known to invade reclamation areas from surrounding, undisturbed areas, but the plants usually do not persist in any large quantities after the native vegetation becomes established. However, if future landowners convert the reclaimed areas to alfalfa haylands, the possibility of the occurrence of a copper:molybdenum imbalance would be increased if this vegetation were the primary source of food for the animals.

N Generally, there is no need to special order mineral blocks with copper supplements. Most products (such as mineral blocks, range cakes, etc.) sold in Montana contain trace minerals including copper (Bob Beltkamp, AgriBasics, Paul Engel, Farr Better Feeds, and Dave Kirstein, ConAgra-Westfeeds, oral commun., October 1, 1984). There is much evidence in the literature that copper supplements prevent (and eliminate) symptoms of molybdenosis. (See, for example, discussions by Erdman et al., 1977; Dollahite et al., 1972; Underwood, 1971, pp. 127-135; Miltimore and Mason, 1971; and Dye and O'Harra, 1959.) The critical parameter is the copper:molybdenum ratio in the forage. Copper supplements would prevent molybdenosis, which, at least in part, is a copper deficiency.

O The statements presented in the EIS are summarized from analyses conducted to predict the useful life of the reservoirs under various scenarios of erodibility and maintenance schedules. One scenario in the assessment of the useful life of the impoundments included an evaluation of elevated erosion rates, a high sediment delivery ratio, and an aerated sediment source. It also was assumed that pre-sediment basins were full and nonfunctional and that the ponds were not maintained. Results of this analysis of pond life indicate the ponds would be rendered inoperative by sediment deposition within 50 years. Under a different scenario, more realistic assumptions were utilized in calculating the useful life of the impoundments which resulted in the figures presented in the EIS.

LETTER 10

Mr. Dennis Hemmer, Commissioner
August 3, 1984
Page 3

increased sediment loads. At page III-10 ¶1, the DEIS states that 73% of the reclamation soil is highly erosive and has low water holding capacity. Finally, the DEIS states, at III-8, ¶1, that Westmoreland plans to use "steep slopes" (which also increase the possibility of erosion) in its coulee reclamation.

How will the maintenance requirements for these reservoirs differ from the maintenance requirements of the existing and improved springs?

Q Through how long a period of time will there be a 70% probability that water would be in the pond throughout the year? Does this estimate take into account the high peak flow/low base flow effect noted at III-5, ¶4?

R What are the analyses referred to in ¶2

S What data are referred to in ¶3?

T The discussion at paragraphs 2-4 does not appear to take into account consumption by wildlife and livestock. It omits the effect of transpiration. It assumes that the pond will remain (relatively) sealed throughout its life time and apparently ignores the potential for increases in the permeability of the bottom of the pond.

U III-6 to -7. While the DEIS concludes that the spring system would be destroyed and that the impacts to groundwater would be significant, mitigation measures are directed only to secondary impacts.

V III-7, ¶1. The last sentence concludes that the North Coulee contributes little water to East Fort Sarpy Creek. This is misleading. It is apparent that it refers to surface flow. But the DEIS should recognize that surface flow is not the only contribution to the East Fort. Compare this discussion of impacts with the discussion of the existing environment at III-10, ¶6.

W III-7, ¶3. This paragraph discusses the possible post-mining groundwater regime. Has the Department compared infiltration and (lateral) inflow rates with the transmissivity of downhill strata?

X III-7, to -8, ¶4. What is the expected permeability of the underlying spoils? Has the Department not measured such permeabilities in spoils at Westmoreland, at Decker, or at Colstrip? What compaction methods will achieve the necessary permeabilities?

Y III-8, ¶2. How will TDS increases affect groundwater use after mining?

Z III-8, ¶6. What are the sustained yields of the wells inspected by the Department on July 19, 1984?

AA III-9, ¶1. Please define "viable."

BB III-9, ¶2. Would the proposed mitigating measures render the impacts to groundwater non-significant?

Maintenance of the impoundments following mining would probably be limited to periodic (from every several years to up to 20 years in frequency) cleaning of the pre-sediment basins and possible annual inspections to assure that the impoundments are safe and the emergency spillways can be used.

P Existing improved springs in the North Coulee area require periodic excavation similar to what the pre-sediment basins for the impoundments would require.

Q See text changes for clarification.

R The analyses and data referenced in the EIS are contained in Westmoreland's permit application (bk. I, primarily in vol. 11, ex. I-33). Additional analyses have been conducted and are referenced in new text prepared for chapter III, Hydrology.

S See answer R.

T Water consumption by cattle and wildlife is a negligible factor in calculating losses from the ponds. Losses to ground water seepage and evaporation are much greater and have been included in the analyses referenced in the new chapter III text.

DSL and OSM do not agree that there is a potential for increasing permeability in the pond bottoms with the passage of time. Far more common and likely is that pond bottom permeabilities will decrease with time as very fine sediment accumulates.

U The loss of the springs would be permanent. Mitigating measures to save the springs while mining through the area have not been developed, and it is extremely improbable that they could be. The significant ground water impacts you reference would be local and only affect the springs.

V The sentence you reference does not refer only to surface flow. It refers to both surface and ground water discharge from North Coulee to East Fork Sarpy Creek. Also of importance are the facts that North Coulee ground water flow is practically all of the coulee's contribution to East Fork Sarpy Creek. Ground water flow in the East Fork Sarpy Creek alluvium, on the other hand, is only a portion of total flow in the East Fork system. Surface runoff from North Coulee is very rare, whereas East Fork Sarpy Creek is probably perennial. Combined surface and ground water flow in East Fork Sarpy Creek is much greater than the 102 acre-feet per year specified in the EIS. Surface water flow in East Fork has been measured at 538 to 920 acre-feet per year at the Cady place.

W We have reviewed data on hydraulic properties of bedrock and unconsolidated ground water zones in and around Westmoreland's Tract III property. These reviews are a necessary part of any analysis pertinent to the ground water system.

X Spoil permeability at the Absaloka Mine is expected to range between 4 and 25 gallons per day per square foot, based on tests from mines completed elsewhere in southeastern Montana. See letter 8, answers V and X.

LETTER 10

Mr. Dennis Hemmer, Commissioner
August 3, 1984
Page 4

CC III-10, ¶1. How is this discussion affected by Westmoreland's plan to use steeper slopes in the coulees (See p. III-8, ¶1.)? How will this condition affect sedimentation of the proposed reservoirs after reclamation?

DD III-12, ¶2. If the Fort Collins loan is preferable to the Alice or the Nelson soils, why is it not being used in the first place? Where will it come from?

EE III-12, ¶4. For how long must the "careful monitoring" (referred to in this paragraph) continue?

FF III-12, ¶5. What is the transmissivity of the coulee bottom soils? How long will drying take? How many trenches must be built? How much area will each trench dewater? What plan is there to pump water from the trench? Where will the pumped water be discharged?

GG III-13 to 14. The discussion here concludes that, after reclamation, grass production will increase. Aside from this increase in biomass, will there by any changes in the carrying capacity of the range after mining? If so, what will they be?

HH III-18, ¶1. This paragraph suggests that losses of aquatic habitat may be mitigated by overflows from wells. How effective is this mitigation measure likely to be after bond release and over many years?

CHAPTER IV.

II The abbreviated discussion of alternatives in Chapter IV is the most serious deficiency of the Draft EIS. It omits alternatives which, although apparently feasible, the Department believes it may not implement under the Montana Strip and Underground Mine Reclamation Act of 1974.

The Department has, and may exercise, independent authority under MEPA in requiring alternatives, and especially less environmentally damaging alternatives, even though they may not be within the purview of SUMRA. Such authority has been upheld in California, in New York, and in Wisconsin and Washington (whose state environmental policy acts are virtually identical to Montana's.) No state supreme court has limited its state agency's authority under its state environmental policy act, except when such an act was non-existant or more limited than MEPA.

JJ The Department has failed to consider and discuss the alternatives of mining various areas of Tract III prior to permitting the destruction of the North Coulee area. For example, it appears feasible to extend the mining cuts of the existing permit in Sections 24 and 25 south into section 36. It also appears feasible to extend the cuts of that permit area into that portion of sections 30 and 31 for which a permit is now being sought, but which is not planned to be mined until 2010 (according to figure I-2.) The Draft EIS must, but fails to discuss such alternatives.

KK Paragraph 5 of page IV-1 is inconsistent with Figure I-1.

LL In summary, the failure to discuss conflicting scientific opinion and the omission

Y See answer H.

Z We assume you are referring to a well or wells completed in the sub-Robinson aquifer. Please see letter 7, answer CC.

AA Viable, as used in this context, means usable or useful to man and/or wildlife.

BB The intent of the mitigating measures described is to enhance a shallow ground water system in the reclaimed coulee bottoms and to reduce leakage from constructed impoundments. These actions would promote reestablishment of postmining vegetation in the coulee bottoms and increase the time the impoundments contain water. Such mitigating measures would also benefit stock and wildlife.

CC We assume in the first portion of your comment you are referring to the feasibility of using topsoil in reclaiming the relatively steeper side slopes along the coulees. The steeper northeast-facing slopes described in the text may be more erodible than lower-gradient surfaces, owing to the fine sand fraction of the soils. This difference, however, may be small if revegetation is successful. (See also letter 8, answer B.) It is anticipated that sedimentation rates would be greater from high erosion hazard areas than from less steep areas. Thus, more frequent maintenance of designed impoundments may be required when the reservoirs are located below areas where high erodibility is suspect. This does not preclude the use of steeper slopes in drainage reclamation.

In any case, we have reevaluated the erosion potential of the coulee side slopes and, after several field observations, have determined that erosion would not be a significant problem. Therefore, sedimentation as a result of side slope erosion would most likely be negligible. Please note text changes.

Direct hauling topsoil to reclamation areas would enhance revegetative success and productivity. This, in turn, would result in greater vegetative cover, reduced erosion, and decreased reservoir sedimentation, all of which are highly desirable in a reclaimed environment.

DD The Fort Collins soil is proposed for salvage by Westmoreland. (See table III-2.) We have recommended increasing the salvage depth for this particular soil, and decreasing the salvage depths of the Alice and Nelson soils. The Fort Collins soil would come from wherever it occurs on the landscape within the proposed disturbance area. In its application, Westmoreland has submitted a detailed soil survey, which includes a map showing the locations of the various soils.

EE Careful monitoring is recommended until vegetation becomes well established.

FF Since no specific plan for the drainage of these soils is included in the permit application, no specific data are available to answer your questions. If the company decides (or is required) to drain these soils before salvage, a specific plan would then be drafted and submitted to DSL for approval.

LETTER 10

of reasonable alternatives renders the Draft EIS legally insufficient.

Again thank you for the opportunity to comment.

Sincerely,

Jeffrey T. Renz

JTR/jab

cc: Mr. Ed Dobson

84R-34

GG See answer I. Recommended stocking rates are covered under Land Use and effects on wildlife are discussed under Wildlife.

HH After bond release, the success of the overflow ponds would depend on continued pumping of the wells and maintenance by the landowners. If the wells are not pumped the ponds would, of course, go dry.

II See snswer C. Your comments are noted.

JJ See answer C.

KK Chapter IV contains an analyses of application rejection. Chapter I describes application approval. We assumed, for the purposes of illustrating extreme circumstances following application rejection, that the mine would close after Westmoreland mines the lands already permitted. To maintain its production rate in such a case, Westmoreland would have to increase production in section 36. State coal would thus be depleted in 1990, 9 years earlier than if the application is approved.

LL Your comment is noted.

LETTER 11

United States Department of the Interior
NATIONAL PARK SERVICE
ROCKY MOUNTAIN REGIONAL OFFICE
655 Parfet Street
P.O. Box 25287
Denver, Colorado 80225

IN REPLY REFER TO:

L7619 (RMR-PC)

0 2 AUG 1984

RECEIVED
AUG 08 1984
STATE LANDS

Mr. Kit Walther
Environmental Analysis Bureau
Montana Department of State Lands
Capitol Station
Helena, Montana 19620

Dear Mr. Walther:

The National Park Service has reviewed the draft environmental impact statement for Westmoreland Resources' Absaloka Mine Revised Plan. We have determined that this proposal will have no effect on any area where the National Park Service has expertise, jurisdiction by law, or management responsibility.

Sincerely,

Robert [signature]

for Richard A. Strait
Associate Regional Director
Planning and Resource Preservation

Thank you for your comment.

LETTER 12

United States Environmental Protectic Agency

Region 8, Montana Office
Federal Building
301 S. Park, Drawer 10096
Helena, Montana 59626

EPA

AUG 2 1984

Ref: 8MD

Mr. Kit Walther
Department of State Lands
Capitol Station
Helena, MT 59620

Re: D-OSM-J01063-MT

Dear Mr. Walther:

We have completed our review of the draft environmental impact statement on the "Absaloka Mine - Revised Plan".

A The United States Environmental Protection Agency's (EPA) major concern is groundwater impacts. The DEIS states that 13 springs, three perennial, will be lost to strip mining. This loss will have a severe impact on future livestock and wildlife use in the area.

B Reservoirs constructed during reclamation may be dry during part of the year. These reservoirs will not adequately replace the three perennial springs. The possibility of spring flow following reclamation is unknown. It therefore cannot be considered as a replacement water source.

C EPA supports the groundwater reclamation attempts and the construction of reservoirs. The Agency believes that the applicant should also be responsible for constructing wells into a deeper aquifer or other year round water holding facilities.

D According to EPA's system for rating draft EIS's this statement is rated ER-1 (environmental reservations-sufficient information). Our reservations concern the project's impact on groundwater. The DEIS is well-written and informative.

If you have questions please contact Mr. Gene Taylor in this office at 449-5486.

Sincerely yours,

John F. Wardell

John F. Wardell, Director
Montana Office

A The draft EIS stated (p. III-5) that the application plan would result in the loss of eight springs. (Note that the final EIS states that seven springs will be lost because one ground water discharge has previously been defined as two separate springs.) See also letter 8, answer H.

Your opinion of the impact of the loss of springs on postmining land use is noted. DSL and DOI will take all opinions into consideration, along with regulatory responsibilities, to make the final decision on approval for mining.

B The probability of the postmining reservoirs containing water for any portion of time has been evaluated for the EIS (Stiller and Associates, 1984a), and this probability has been used to predict the success of these impoundments as postmining water sources.

Given the design criteria of pond 20 provided by Westmoreland, the geologic characteristics of the proposed impoundment site, and accepted principles of ground water hydraulics, there is a very good probability that spring 12 will discharge at least a small amount after mining and reclamation.

C Comment noted.

D Comment noted.

LETTER 13

NORTHERN PLAINS RESOURCE COUNCIL

Field Office
Box 858
Helena, MT 59624
(406) 443-4965

Main Office
419 Stapleton Building
Billings, MT 59101
(406) 248-1154

Field Office
Box 886
Glendive, MT 59330
(406) 365-2525

RECEIVED
AUG 07 1984
STATE LANDS

Dennis Hemmer
Commissioner
Montana Department of
State Lands
1623 Eleventh Ave
Helena, Montana 59620

August 3, 1984

Re: Westmoreland Resources revised mine plan DEIS

Dear Commissioner Hemmer,

Thank you for the opportunity to briefly comment on Westmoreland Resources Absaloka mine draft EIS.

We are concerned with the seeming casual manner in which the permanent destruction or loss of springs in the expansion area is addressed.

A Further, why does the State feel that the hydrologic balance as referenced in MCA 82-4-227(a) has been or will be preserved?

B We submit, that the nature of this local hydrologic system is unique and ecologically fragile as defined by 82-4-227(2)(a). Does the State agree with our contention that the destruction of the springs in this area would prevent the land from returning to its former ecological role?

C In answering our question, would the State please define what would, or could be considered hydrologically unique?

We would like to repeat our concern over the permanent loss of the springs in the proposed Absaloka expansion. We again thank you for the opportunity to comment and look forward to hearing from you on this matter.

Respectfully submitted,

Russ Brown
Russ Brown
NPRC Staff

A The analysis concludes that the impacts to the local hydrologic system (North Coulee) would be minimal because springs affected by mining the application area would be replaced with two permanent impoundments and two wells. Mining the application area would ultimately result in a hydrologic system comparable to that which exists today.

B Westmoreland plans to (1) replace water sources, (2) provide for measures to increase soil moisture in the coulee bottoms, and (3) reestablish a mosaic of vegetation and habitat types. These plans would reduce the impacts that would result from removal of the springs.

C The term "hydrologically unique" is not used or defined in the Montana Strip and Underground Mine Reclamation Act or rules.

LETTER 13

REFERENCES

Montana Bureau of Mines and Ceology (MBMC). Ground Water of the Fort Union Coal Region, Eastern Montana. Special Publication 80, Butte, 1978.

Moran, S. R., Cherry, J. A., Rehn, B. and Croenewold, G. H., "Hydrologic Impact of Surface Mining of Coal in Western North Dakota". Symposium on Surface Mining Hydrology, Sedimentation and Reclamation. University of Kentucky, Lexington, Kentucky, 1979.

Pagenkopf, C. K., and Whitworth, C. "Influence of Spoil Material in Ground Water Quality". Energy Communications 3(2): 107-126. 1977.

Rohn, P. H., Potential of Coal Strip-Mine Spoils as Aquifers in the Powder River Basin. Project Completion Report by South Dakota School of Mines and Technology for Old West Regional Commission, Billings, 1976.

LETTER 14

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
MILES CITY DISTRICT OFFICE
P.O. Box 940
Miles City, Montana 59301

IN REPLY REFER TO:
3400

AUG 0 8 1984

RECEIVED
1984
STATE LANDS

Mr. Kit Walther
Montana Department of State Lands
Capitol Station
Helena, Montana 59620

Dear Mr. Walther:

The Environmental Impact Statement for the Absaloka Mine revised plan has been reviewed by several personnel in the Miles City District Office. The only comment concerns post-mine water quality at Spring #12 and appears below.

The hydrology section of Chapter III (page III-7) states that post-mine water quality at Spring #12 would be at least as good as before. In Chapter II, it is mentioned that Spring #12 receives part of its recharge from an area that is to be mined. Based on studies by Pagenkopf et al (1977), Rahn (1976), Moran et al (1979), and MBMG (1978), it appears Spring #12 will probably experience increased TDS levels as ground water travels through reclaimed spoils toward the spring.

Thank you for the opportunity to review this EIS.

Sincerely ours,

Robert A. Teegarden
District Manager
ACTING

Attachment

The projection that postmine water quality at spring 12 would be at least as good aa before mining is based upon the conclusion that postmining surface runoff contained in pond 20 would be of relatively high quality. This water would be the recharge source for postmining aeepage at spring 12. Note that according to Westmoreland's preliminary design criteria for pond 20, the lower portion of the impoundment would be constructed on undisturbed ground. Therefore, apoil ground water quality is not considered aa an influencing factor on postmining spring 12 water quality.

The equilibrium poetmining spoil ground water system probably would not discharge to North Coulee in the vicinity of pond 20 or spring 12 because the impoundment'a typical water level would hydrologically recharge the coulee bottom sedimenta. The hydraulic gradient would be from the pond to the coulee and not from the spoil to the pond or coulee bottom near spring 12.

LETTER 15

DEPARTMENT OF HIGHWAYS

TED SCHWINDEN GOVERNOR — STATE OF MONTANA — 2701 PROSPECT, HELENA MONTANA 59620

July 31, 1984

Mr. Kit Walther
MT. Department of State Lands
Environmental Analysis Bureau
1539 Eleventh Avenue
Helena, MT 59620

Dear Kit:

Thank you for the opportunity to review the draft environmental impact statement for Westmoreland Resource's revised plan at the Absaloka Mine in Big Horn County.

If and when the demand for coal once again increases, the cumulative impact of the unit trains hauling coal from Decker, Colstrip, Tongue River, and the Absaloka Mine, would be very significant and will create monumental problems for those areas such as Miles City with an at grade crossing within the heart of the Central Business district.

There is no mention of mitigating measures which should be shared by all the companies that plan to mine coal and transport by rail.

We feel that this issue has not been properly addressed and should be. City and county governments do not have the financial resources to correct some of the problems that are being created due to the extensive coal development.

Sincerely,

William S. Strizich

William S. Strizich, P.E., Chief
Project Analysis Bureau

WSS:DC:sk:2r

cc: Robert E. Champion
Jay Randall
Homer Wheeler
Ralph Driear

The cumulative impact of unit train traffic on eastern Montana communities hauling coal produced at existing and proposed mines in the region is addressed in the Decker Area Mines Comprehensive Social Sciences Study prepared by Mountain West Research-North, Inc. (May, 1983), and the Tongue River Railroad Draft EIS, Finance Docket No. 30186 prepared by the Interstate Commerce Commission (ICC) (July 15, 1983), as referenced in the Westmoreland EIS. Estimates of increases in unit train traffic range from 150 to 500 percent over today's traffic of approximately five one-way unit train trips per day. Such increases would block train crossings in Forsyth and Miles City less than 9 percent of the average day by 1991, but up to 14 percent by 2011 (ICC, 1983, p. A3-8). Such projections of increased unit train traffic are based on assumptions that the following new mines are permitted and reach capacity production: Montco, Wolf Mountain, CX Ranch, Young Creek, Otter Creek, and four other unnamed mines in the Otter Creek area.. Such levels would represent an additional 70 million tons production annually above the 1983 level of 28.4 million tons, a 250 percent increase. The demand for and sale of Montana coal would have to increase substantially in the next few years for such production levels to be realized.

The Tongue River Railroad Draft EIS also identifies measures which can be undertaken to mitigate increased coal unit train traffic in eastern Montana. The type and cost of such measures were based on criteria supplied by the Montana Department of Highways (ICC, 1983, p. A3-12).

Total mitigation costs range from $470,000 to $560,000, which does not include the cost of constructing grade separations, about $3,500,000 each.

The State of Montana levies a coal severance tax, a percentage of which is allocated to a local impact and education trust fund account. The coal board, comprised of seven persons appointed by the governor to serve four-year terms, reviews grant applications from local governments and approves expenditures from the fund. Coal severance tax revenue has been used to fund road improvements in areas affected by development of coal mines.

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CONSULTATION AND COORDINATION

RESEARCH AND WRITING

The following people prepared the EIS:

Charles Albrecht, Environmental Scientist
- E.M. Mining Engineering, Colorado School of Mines, 1967

Carole Armstrong, Office Manager (9/83-present)

Gale Arterbury, Office Manager (1/82-9/83)

Bill Birchard, Editor
- B.A. Biology, Colorado College, 1976

Mark Boster, Environmental Scientist
- B.S. Geology, Ohio State Unviersity, 1970
- M.S. Water Resources Administration, University of Arizona, 1972
- Ph.D. Water Resources Administration, University of Arizona, 1976

Thomas Coefield, Economist
- B.A. Economics, University of Montana, 1970

John Herrin, Geologist/Hydrologist
- B.S. Earth Science, California State University, Long Beach, 1974
- B.S. Geology, Northern Arizona University, 1976

Scott McCollough, Wildlife Biologist
- B.S. Wildlife Biology, Colorado State University, 1977
- M.S. Wildlife Biology, Colorado State University, 1982

Floyd A. McMullen, Jr., Biological Scientist
- B.S. Range-Forest Management, Colorado State University, 1974

Bill Olsen, Air Quality Specialist
- B.A. Biology, State University College of New York, 1971
- Ph.D. Botany, University of Montana, 1983

Dallas Owens, Sociologist
- B.A. Sociology, University of North Carolina, Charlotte, 1972
- M.S. Sociology, Utah State University, 1973
- Ph.D. Sociology, University of Tennessee, 1977

Scott Spano, Soil Scientist
- B.S. Forestry, Michigan Technological University, Houghton, 1976
- M.S. Forest Soils, Michigan Technological University, 1978

Lois Steinbeck, Economist
- B.S. Economics, Colorado State University, 1977.

Kit Walther, Project Chief
- B.S. Zoology, University of Montana, 1966
- M.S.T. Biological Sciences, University of Montana, 1971

Stiller and Associates Inc. prepared the hydrology and geology section of the EIS.

All maps in the EIS were prepared, under the direction of Don Ellingson, by Westmoreland Resources.

REVIEW

The following people from the Department of State Lands reviewed this document:

Gary Amestoy, Reclamation Division Administrator

Theresa Blazicevich, Wildlife Biologist

Terry Conway, Range Specialist

Pat Driscoll, Air Quality Specialist

Neil Harrington, Soils/Reclamation Supervisor

John Herrin, Hydrologist

John North, Legal Counsel

Sandi Olsen, Coal Bureau Chief

Dave Paszkiet, Mining Engineer

The following people from the Office of Surface Mining also reviewed this document:

Donald Donner, Geologist

Willis Gainer, Senior Project Manager, Federal Programs and Indian Lands

Duane Gentz, Soils Specialist

Donald Henne, Wildlife Biologist

Foster Kirby, Archeologist

Lawrence Kline, Vegetation, Land Use, Recreation, and Visual Resources Specialist

John Lovell, Chief, Branch of Federal and Indian Programs

Donald Minges, Hydrologist

PEOPLE, AGENCIES, AND COMPANIES CONSULTED

The following agencies and companies (other than those cited in the text) provided information used to analyze Westmoreland Resources' mine plan:

Big Horn County Commission, Hardin, Montana

City of Sheridan, Sheridan, Wyoming

Crow Tribe of Indians

Kiewit Mining and Engineering Co., Sheridan, Wyoming

Montana Bureau of Mines and Geology, Billings, Montana

Montana Department of Commerce, Helena, Montana

Montana Department of Fish, Wildlife, and Parks, Helena, Montana

Montana Department of Health and Environmental Sciences, Air Quality Bureau, Helena, Montana

Montana Department of Highways, Helena, Montana

Montana Department of Institutions, Helena, Montana

Montana Department of Natural Resources and Conservation, Helena, Montana

Montana Department of Revenue, Helena, Montana

Montana Department of Social Rehabilitation Services, Helena, Montana

Montana Department of State Lands, Coal Bureau, Helena, Montana

Northern Cheyenne Planning Office, Lame Deer, Montana

Sheridan County Commission, Sheridan, Wyoming

State Historic Preservation Office, Helena, Montana

U.S. Department of Health and Human Services, Indian Health Services, Billings, Montana

U.S. Department of the Interior, Bureau of Indian Affairs, Billings, Montana

U.S. Department of the Interior, Bureau of Land Management, Billings, Montana

U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana

The Department of State Lands and Office of Surface Mining appreciate the assistance of Westmoreland Resources, Inc. The company provided the Environmental Analysis Bureau with information on the proposed mine and drafted all of the maps in the EIS.

REVIEW OF THIS STATEMENT

In accordance with environmental law, copies of the draft EIS were sent to the public for comments and suggestions. All comments were carefully considered in the preparation of the final EIS. Comments on the final EIS can be sent to Commissioner Dennis Hemmer, Montana Department of State Lands, Capitol Station, Helena, MT 59620.

The final EIS is available for review in the following places:

- Montana Department of State Lands, 1625 11th Avenue, Helena, Montana.
- Big Horn County Public Library, 419 North Custer Avenue, Hardin, Mont.
- Miles City Public Library, 1 South 10th, Miles City, Montana.
- The Rosebud County Library, 201 North 9th Avenue, Forsyth, Montana.
- Parmley Billings Public Library, 510 North Broadway, Billings, Mont.
- Sheridan County Fulmer Public Library, 320 N. Brooks, Sheridan, Wyom.

Copies are also available on request from the Department of State Lands, Capitol Station, Helena, MT 59620 and from the Office of Surface Mining, Western Technical Center, Brooks Towers, Second Floor, 1020 15th Street, Denver, Colorado 80202.